# The American Journal of Surgery

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June 1950

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FIFTY-NINTH YEAR OF PUBLICATION

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# The American Journal of Surgery

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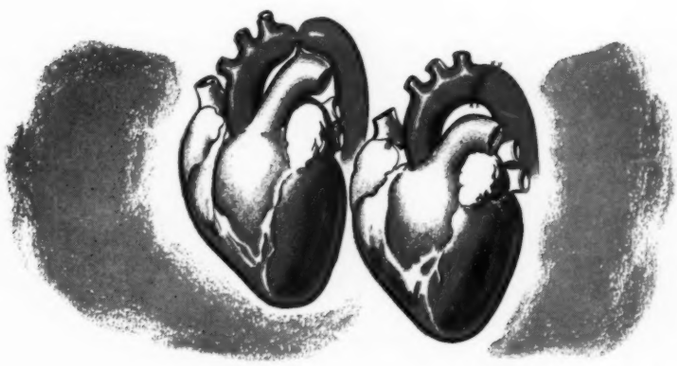
# Dramatic Advances in Surgery



In recent years dramatic progress has been made in cardiac surgery. Congenital heart disease resulting in a life of invalidism and early death has yielded to the pioneer efforts of thoracic surgeons. Blue babies and youngsters unable to carry on the usual activities of living have been given a "new lease on life."

Davis & Geck presents a series of illustrations showing the steps in some of these new operations, and offers its cooperation to develop still further the proper sutures to meet the needs of this rapidly advancing branch of surgery.

On the following pages the steps in one of the new major procedures—to correct coarctation of the aorta—are illustrated, and call attention to the vital role that sutures play in assuring the success of the technique employed.

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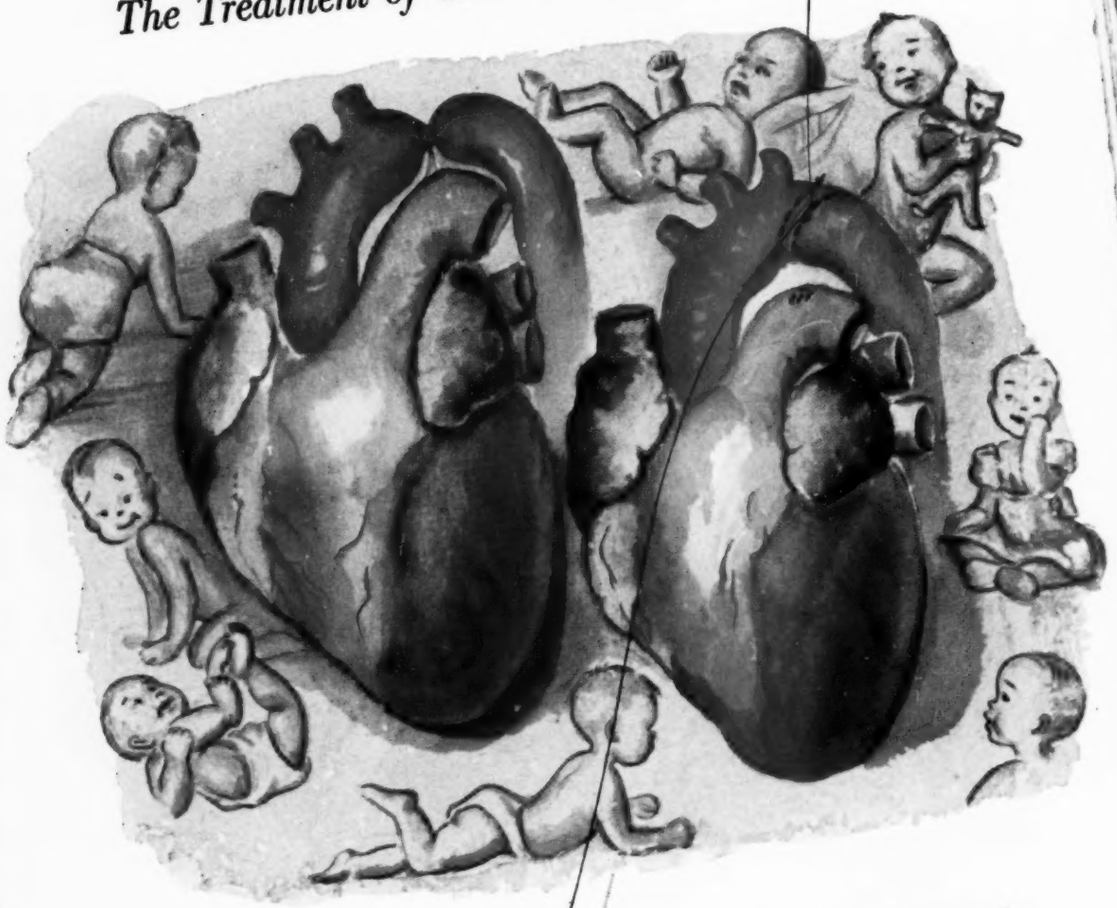
DRAMATIC ADVANCES IN SURGERY

## *The Treatment of Coarctation of the Aorta*



This procedure attempts to restore normal blood flow in the aorta by removal of a stenotic section and approximation of the cut ends by suturing. Success depends upon the skill of the surgeon and on the correct behavior of the sutures. The sutures must not only prevent leakage of blood until this large and important blood vessel heals, but also the suture line must later grow with the aorta because this procedure is often done in young patients.

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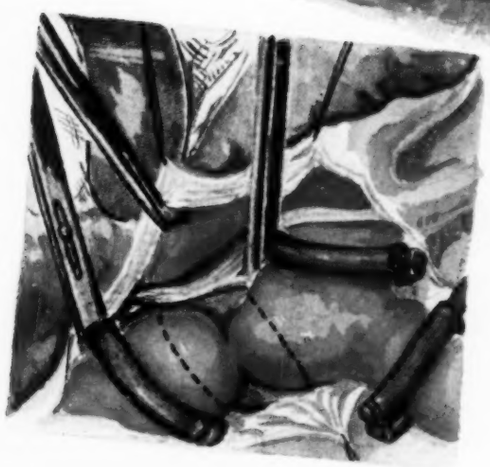
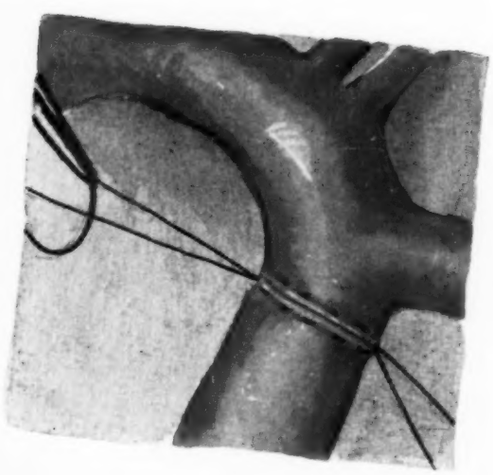


Aorta exposed. Coarctation shown with lines of excision. Clamps applied above and below.

Sutures placed for posterior layer. Carrel technique used. Intima approximated to intima to prevent formation of blood clots. The wall proper is sutured in the second layer.



Anterior suture line completed. Clamps removed. Blood again flowing through aorta. Sutured area has lumen as large as rest of the aorta. Occasionally another small interrupted horizontal mattress suture must be used to prevent leakage of blood. Either catgut or silk may be employed.

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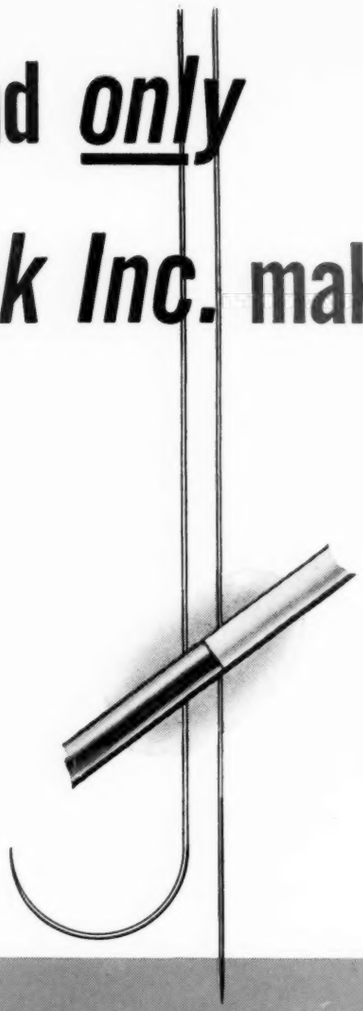

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# The American Journal of Surgery

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## Editorial


CHOICE OF PROCEDURE IN ACUTE CHOLECYSTITIS . . . . . *Moses Behrend* 753


## Original Articles


GYNECOLOGIC MORTALITY . . . . . *William F. Finn* 755

Much has been written on the causes for obstetric mortality but little on gynecologic deaths. The author considers the immediate and remote causes of death in 140 cases over a period of sixteen years.

MECKEL'S DIVERTICULUM . . . . . *Hyman Sneierson* 765

The present knowledge of Meckel's diverticulum is reviewed. Twenty-four cases are added to the literature. Rarely diagnosed preoperatively, the condition is invariably found at operation for other abdominal conditions.

MALIGNANT EPITHELIAL TUMORS OF THE SKIN OF HEAD AND NECK . . . . . *Grant E. Ward and James W. Hendrick* 771

The authors cover the many facets of malignant epithelial lesions of the face, neck and scalp. They conclude that benign lesions such as hyperkeratoses, papillomas, senile warts and molds should be removed before malignant transformation occurs. Adequate biopsy should be the rule and, by differentiating between the three types of malignant lesions, proper plans of therapy are possible; x-ray, radium, electrosurgery or surgical excision is considered in the treatment of early skin cancer. This study shows that a high percentage of skin cancer is curable in the early stages if properly treated.

WOUND RUPTURE . . . . . *Benedict B. Landry, John O'L. Nolan and John E. Burns* 787

A consideration of the etiology of wound rupture is presented, with an analysis of these cases by other surgeons and a study of sixty-one cases of wound rupture which occurred between January 1, 1940, and January 1, 1948.

STATISTICAL ANALYSIS OF 1,637 CASES OF CERVICAL CARCINOMA . . *Salvatore di Palma* 793

A statistical analysis of 1,637 cases of cervical carcinoma seen at the New York City Cancer Institute from 1923 to 1946, inclusive. From this analysis the author draws interesting conclusions.

TRANSABDOMINAL SPLANCHNIC ANESTHESIA FOR GASTRIC SURGERY . . . *Bouton F. Sowers* 800

A detailed technic is presented for employment of transabdominal splanchnic anesthesia for gastric surgery.

TECHNIC OF HOLLOW VISCERAL ANASTOMOSIS . *Samuel L. Schreiber and Joe K. Smith* 803

The authors describe a method of anastomosis of one hollow viscus to another whether it is gastro-enterostomy, duodenogastrostomy or enterostomy, entero-enterostomy or esophago-enterostomy. Full consideration is given to the principles underlying successful and adequate anastomosis.


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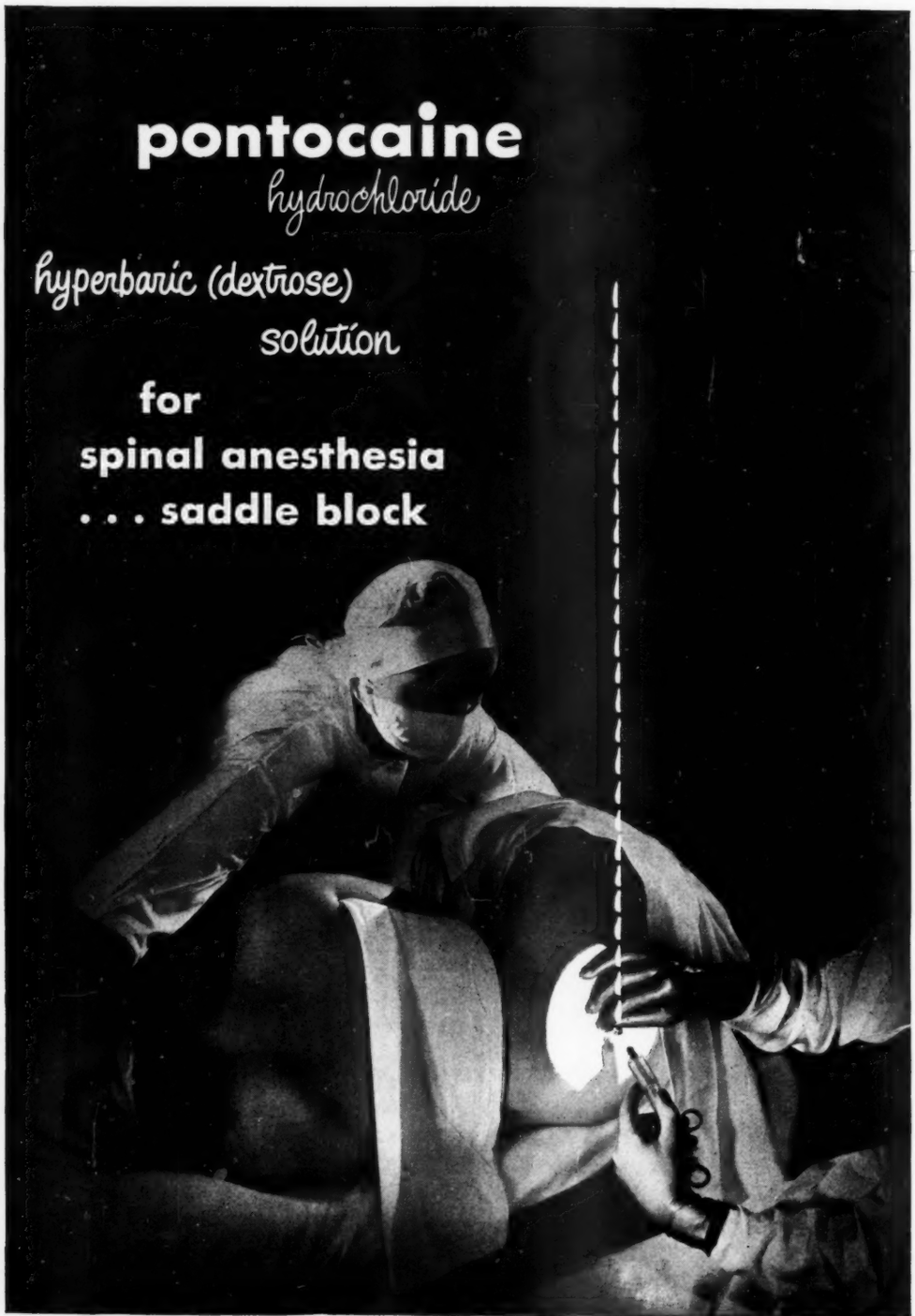


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POST-TRAUMATIC REFLEX DYSTROPHIES . . . . *Harold I. Miller and George F. Miller* 814

A diverse group of clinical conditions make up the syndrome of post-traumatic reflex dystrophies. They follow injury and present pain, vasomotor changes and altered motor function which are usually disabling and almost always respond to early treatment.

AVOIDANCE OF URETERAL INJURY BY ROUTINE PALPATION DURING TOTAL HYSTERECTOMY *John C. Burch and Horace T. Lavely* 819

A simple method of palpation is presented to avoid ureteral injury during total hysterectomy.


## *Streamlined Articles*


MODERN TRENDS IN COLON SURGERY . . . . . *Frank D. Conole* 820

From June, 1948, to June, 1949, twenty-four operations for malignancy were performed at the Binghampton City Hospital. The author reviews the modern trends in colon surgery.

PLASTIC SURGERY ABOUT THE EYE . . . . . *Edward S. Lamont* 824

Various procedures and operative technics are presented for plastic surgery about the eye.

CARCINOMA OF THE ANUS . *Joseph P. O'Brien, Samuel S. Lombardo and A. Oppenheim* 832

A series of forty-seven patients with anal carcinoma is presented, with the treatment employed. The author divides these patients into four groups and outlines the treatment in each group.

TECHNIC FOR INSERTION OF METAL STAPLES IN CASES OF EPIPHYSEAL GROWTH ARREST . *Col. August W. Spittler and Capt. Earl W. Brannon* 834

A technic is presented for the accurate insertion of staples, using the Kirschner wire as a guide, in cases of temporary epiphyseal growth arrest.

ADDITIONAL USES FOR REFRIGERATION IN SURGERY . . . . . *Lyman Weeks Crossman and Hyman Donald Stein* 837

Refrigeration has been applied at City Hospital, New York, since 1941. The authors relate their experience with refrigeration and enumerate additional uses for its employment.

NEW UPPER ABDOMINAL INCISION . . . . . *Donald E. Ross* 841

A new upper abdominal incision is described which is particularly useful for gastric resections and pancreatic surgery.


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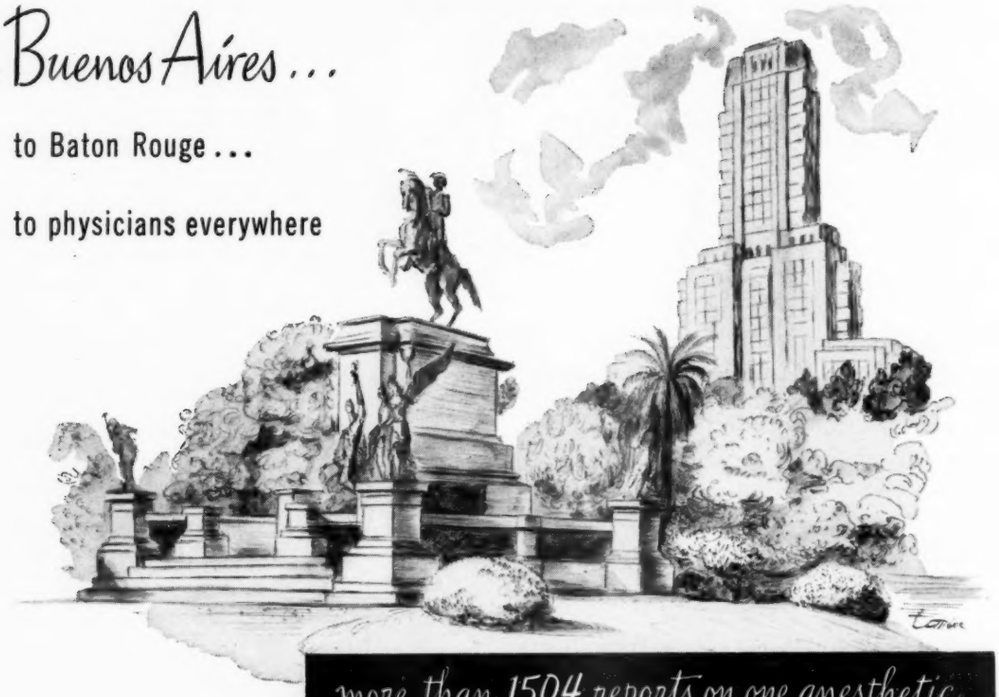
from Buenos Aires . . .

to Baton Rouge . . .

to physicians everywhere



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*1. Ridley, R. W., and Lundy, J. S. (1949), Some Modern General Anesthesia Techniques, Surg. Clin. North America, 29:1571, October.*

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## Case Reports


CARDIOSPASM FOLLOWING VAGOTOMY . . . . . *Roscoe S. Wilcox* 843

A general consideration of vagotomy is presented and a case of cardiospasm following vagotomy in which the symptoms persisted for thirty-six days is reported.

OBSTRUCTION OF THE DUODENUM BY AN ANEURYSM OF THE ABDOMINAL AORTA . . . *E. J. Dunning and T. E. Jones* 848

Presented herein are a review of two previously reported cases of duodenal obstruction by arteriosclerotic aneurysms of the abdominal aorta and a report of a third such case in which the patient had surgical treatment.

MULTIPLE PRIMARY CARCINOMA OF THE COLON AND OVARY . . . . . *Robert M. Levine and Charles B. Ripstein* 851

A report is presented, with discussion of three cases of multiple primary carcinoma of the colon and ovary. The clinical picture was similar in all cases. The multicentric origin of the tumors is apparently established by the pathologic picture and the exclusion of metastases from the original lesion.

EVENTRATION OF THE DIAPHRAGM ASSOCIATED WITH PREGNANCY . *Edward N. Comando* 857

The author adds to the literature a case of eventration of the diaphragm concurrent with two pregnancies.

DESMOID TUMOR IN THE MALE . . . . . *Justus Kaufman* 861

Because of its rarity and because of its interesting histology a case report of desmoid tumor in the male is described.


## New Instruments


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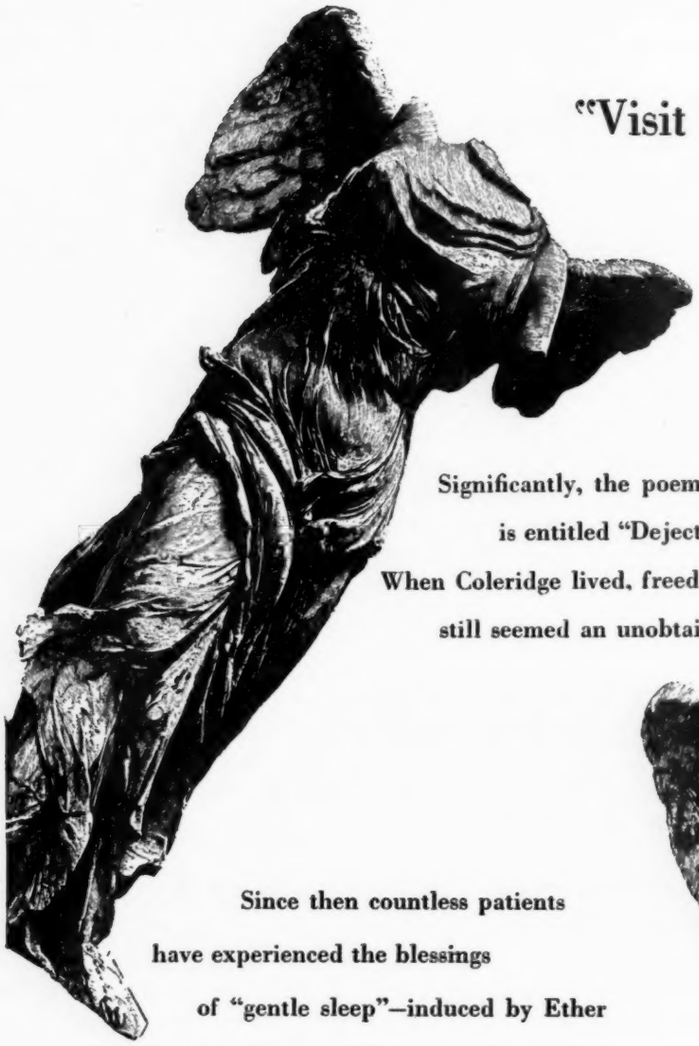

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2. MADDOCK, WALTER G.: Some Fundamentals in Water and Electrolyte Balance, *Ohio St. Med. J., 45:462, 1949.*

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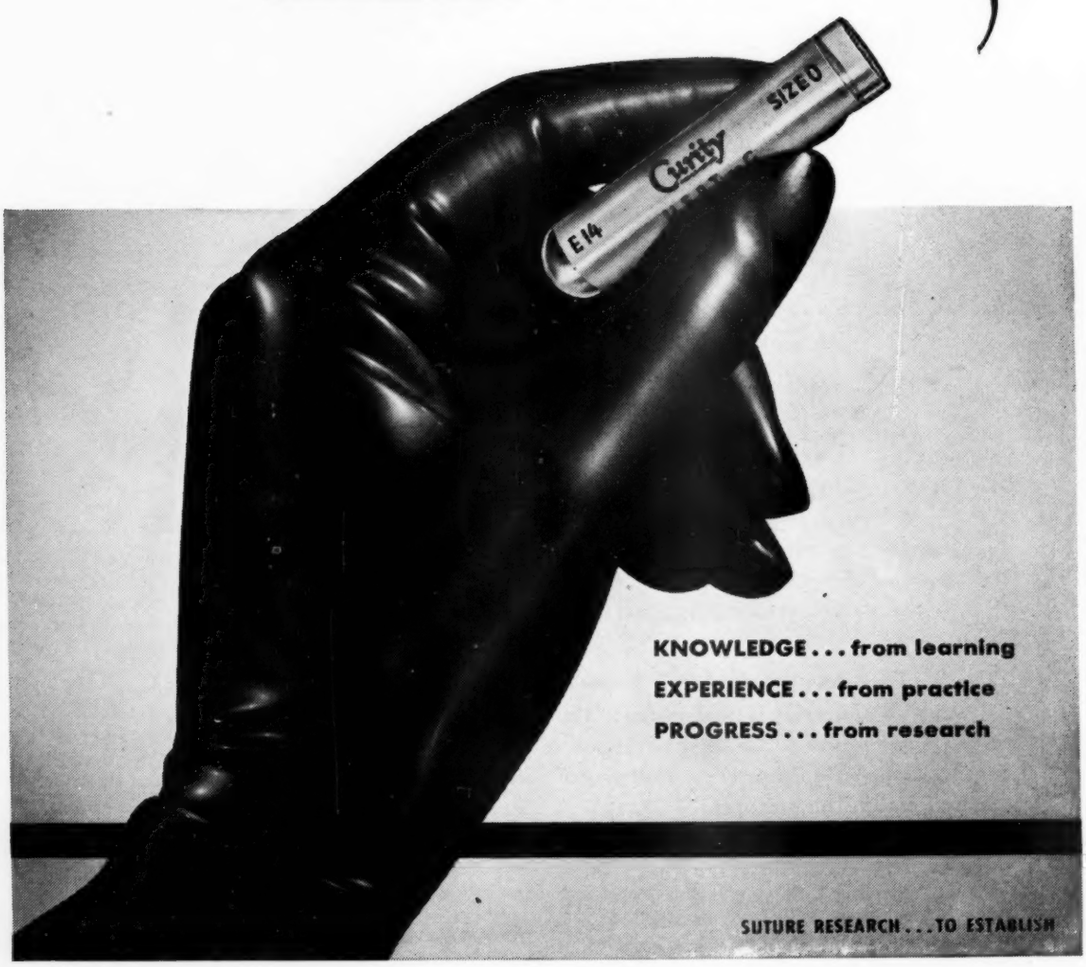
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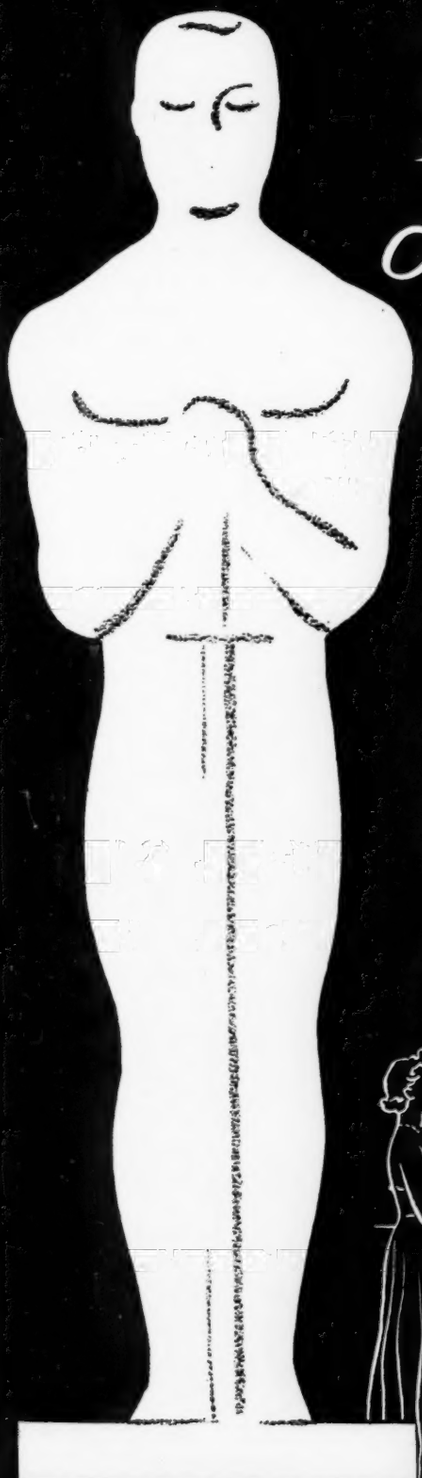

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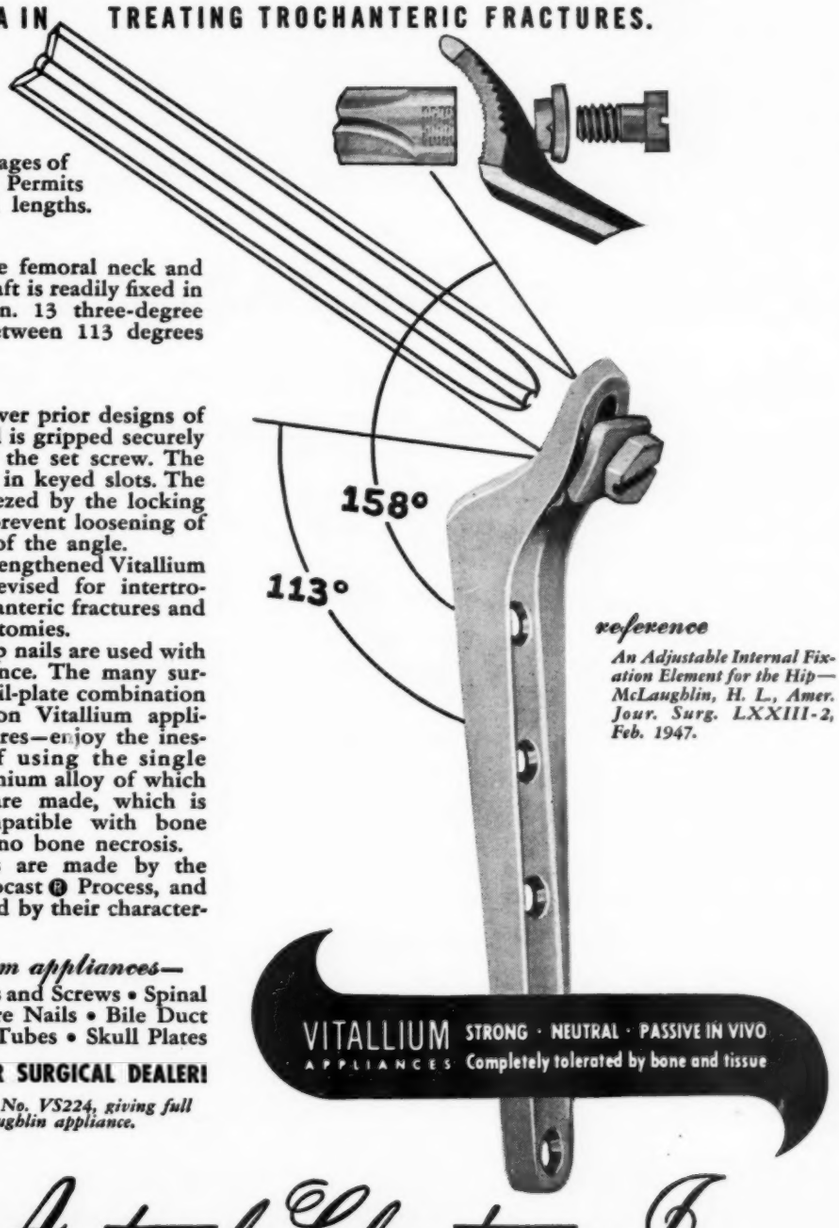


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*An Adjustable Internal Fixation Element for the Hip—McLaughlin, H. L., Amer. Jour. Surg. LXXIII-2, Feb. 1947.*

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Completely tolerated by bone and tissue

MICROCAST VITALLIUM TECHNIQUE

*Austenal Laboratories, Inc.*

NEW YORK — CHICAGO

SURGICAL DIVISION, 224 EAST 39TH STREET, NEW YORK 16, N. Y.

# NEW...

# A BACTERICIDAL SOAP

## FOR PHYSICIANS, SURGEONS

### In Office, Home, Operating Room and All Cleansing Procedures

You'll say it's a top quality bar of hard-milled soap—yet its ingredients give results never obtained from any soap.

Gamophen contains hexachlorophene (2%),* the most effective, longest-acting skin antiseptic known. The soap base was specifically selected to provide optimum release of hexachlorophene's bactericidal properties, without irritating or drying the skin. Gamophen has been tested in 3½ years of laboratory and clinical evaluation.

**WHAT YOU GET IN GAMOPHEN**

Bactericidal action. Sustained low count in regular use. Emollient effect—no irritation. Quick, rich lather in any water. An excellent deodorant. Economy—less than half the cost of liquid soap. Tremendous Time Saver—3-minute scrub is sufficient.

#### Prolonged Antibacterial Effect

Hexachlorophene exerts a prolonged antibacterial effect against resident flora of the skin, gram-positive and gram-negative organisms, pathogenic and non-pathogenic bacteria.

Several investigators have found that the standard scrub of 15 or 20 minutes may safely be reduced to from 3 to 6 minutes when Gamophen is used.

In a series of comparison tests it was found that the bactericidal action of Gamophen was 36% greater against mixed cultures of S. aureus,

*"Hexachlorophene" has been accepted by the Council on Pharmacy and Chemistry of the American Medical Association as the generic term for dihydroxyhexachlorodiphenyl methane.

# GAMOPHEN ANTISEPTIC

**ETHICON SUTURE LABORATORIES**
INCORPORATED
NEW BRUNSWICK, NEW JERSEY

# AND HOSPITAL PERSONNEL

## Emollient, Rich-Lathering, Fast-Acting Continuously-Effective, Economical

S. hemolyticus and E. Coli, and 10% greater against Cl. welchii, than 3½% tincture iodine.

When used routinely for all cleansing occasions in hospital, office and home, Gamophen establishes a protective anti-bacterial film which exerts a continuous action. The marked degree of suppression achieved is maintained as long as this soap is used regularly and for several days after its use is stopped. The use of alcohol or other solvent rinses is contraindicated.

### Bactericidal in 3-minute Scrub

Gamophen Soap is alkaline in solution, with a pH of 8.5 to 9. It is bactericidal in a 3-minute scrub in the concentrations used in normal scrub conditions. It quickly produces a thick, rich lather, even in hard and cold water. Every lot produced is tested for potency.

### WHERE TO USE GAMOPHEN

In office and home. In the hospital wherever soap is used—by staff personnel or patients. For pre-operative antisepsis of skin. Industrial clinics and first aid stations.

In other tests, hexachlorophene in Gamophen was found to be more effective than it was in other vehicles, such as certain liquids having an acid pH, in which it is bacteriostatic but not bactericidal. Liquid solutions having an acid pH lower the effectiveness of hexachlorophene.

Gamophen is supplied in 4½-oz. bars for home and office; in 2-oz. bars for hospital personnel and patients' use.

# SOAP

**SOLD ONLY THROUGH SURGICAL DEALERS**

**FREE—FULL-SIZE BAR FOR TRIAL**

*(May be clipped and pasted to Penny Post Card)*

ETHICON, New Brunswick, N. J. DEPT. AJS-650

Please send Gamophen Soap and Literature.

Dr._____

Street_____

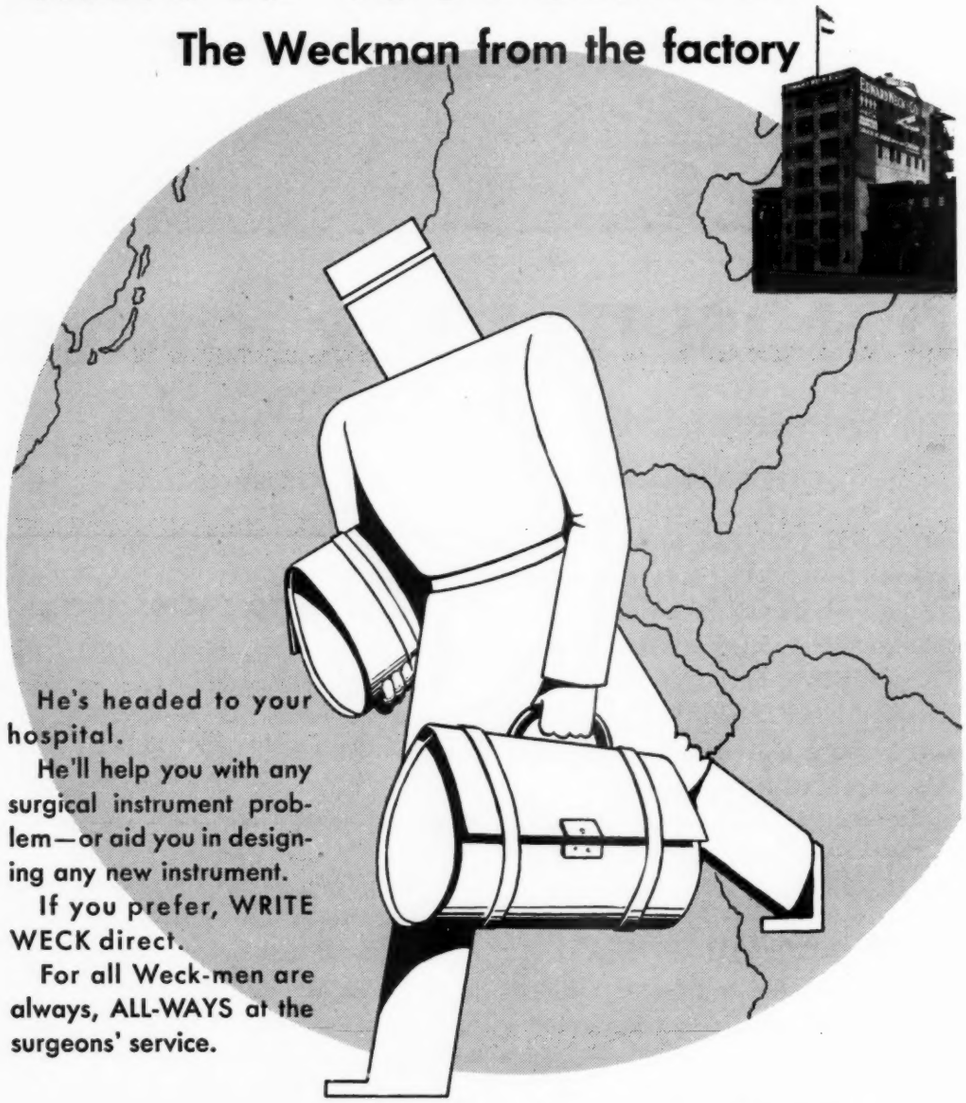
City_____ State_____

*Limited to Profession in U.S.A.*

# ALWAYS...

## ALL-WAYS AT YOUR SERVICE

### The Weckman from the factory



He's headed to your hospital.

He'll help you with any surgical instrument problem—or aid you in designing any new instrument.

If you prefer, WRITE WECK direct.

For all Weck-men are always, ALL-WAYS at the surgeons' service.

**REMEMBER WECK INSTRUMENTS ARE MADE CORRECT—SOLD DIRECT—to HOSPITALS!**

**EDWARD WECK & CO., INC.**

*Manufacturers of Surgical Instruments*

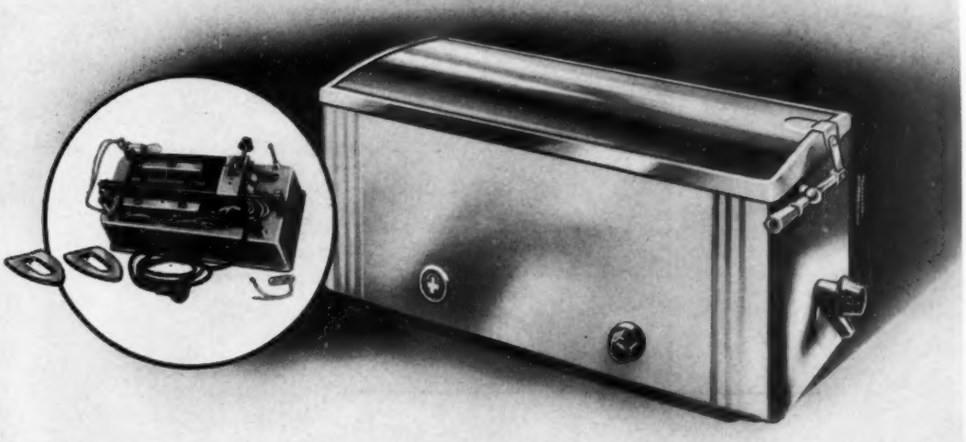
SURGICAL INSTRUMENT REPAIRING • HOSPITAL SUPPLIES

**135 Johnson Street · Brooklyn 1, N.Y.**

WECK — STAINLESS STEEL — CRODON

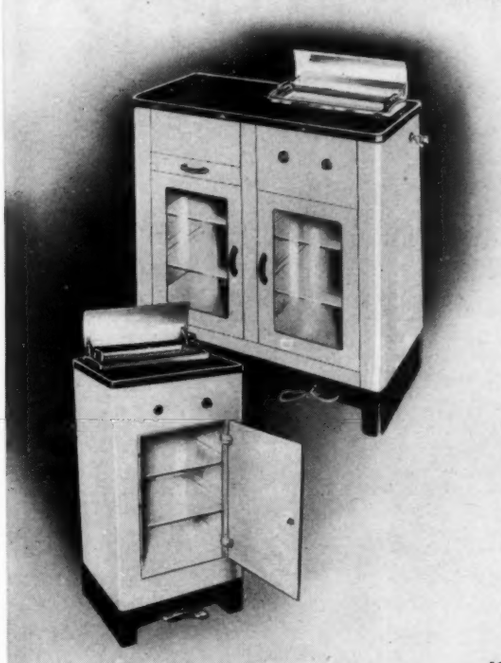
FOUNDED 1890

# Buy with an eye on SERVICE



**"American"**

## SMALL INSTRUMENT STERILIZERS



are automatically burn-out-proof . . . another widely acclaimed feature that assures long, satisfactory life of the unit and constant protection for immersed instruments. IF WATER BECOMES EXHAUSTED beyond a critical level, permanent cut-off of electric current occurs automatically. Operation can only be resumed by replenishing water in the chamber and manually switching on current again.

These superior Small Instrument Sterilizers are ultra modern in every detail . . . designed and built to afford the precision performance provided by large "American" hospital sterilizers used the world over.

**PORTABLE MODELS**
available in three practical sizes.

**SINGLE CABINET MODELS**
constructed in three practical styles.

**DOUBLE CABINET MODEL**
offering ideal facilities for centralizing and office or clinic Sterile Supply.

*ASK YOUR DEALER or write us for further information*

**AMERICAN STERILIZER COMPANY**
Erie, Pennsylvania

*Cremothalidine* is a smooth, exceptionally palatable suspension of *Sulfathalidine*® phthalylsulfathiazole, a remarkably effective, nontoxic enteric bacteriostat, only 5% of which is absorbed from the bowel. *Cremothalidine* is particularly acceptable to children, but is useful in all age groups. It is indicated especially for ulcerative colitis, *E. coli* infections of the urinary tract, and for enteric bacteriostasis in intra-abdominal surgery. *Cremothalidine* is supplied in convenient, wide-mouth *Spasaver*® bottles of 8 fluidounces.
Sharp & Dohme, Philadelphia 1, Pa.

SHARP & DOHME

# Cremothalidine®

*Sulfathalidine Suspension*

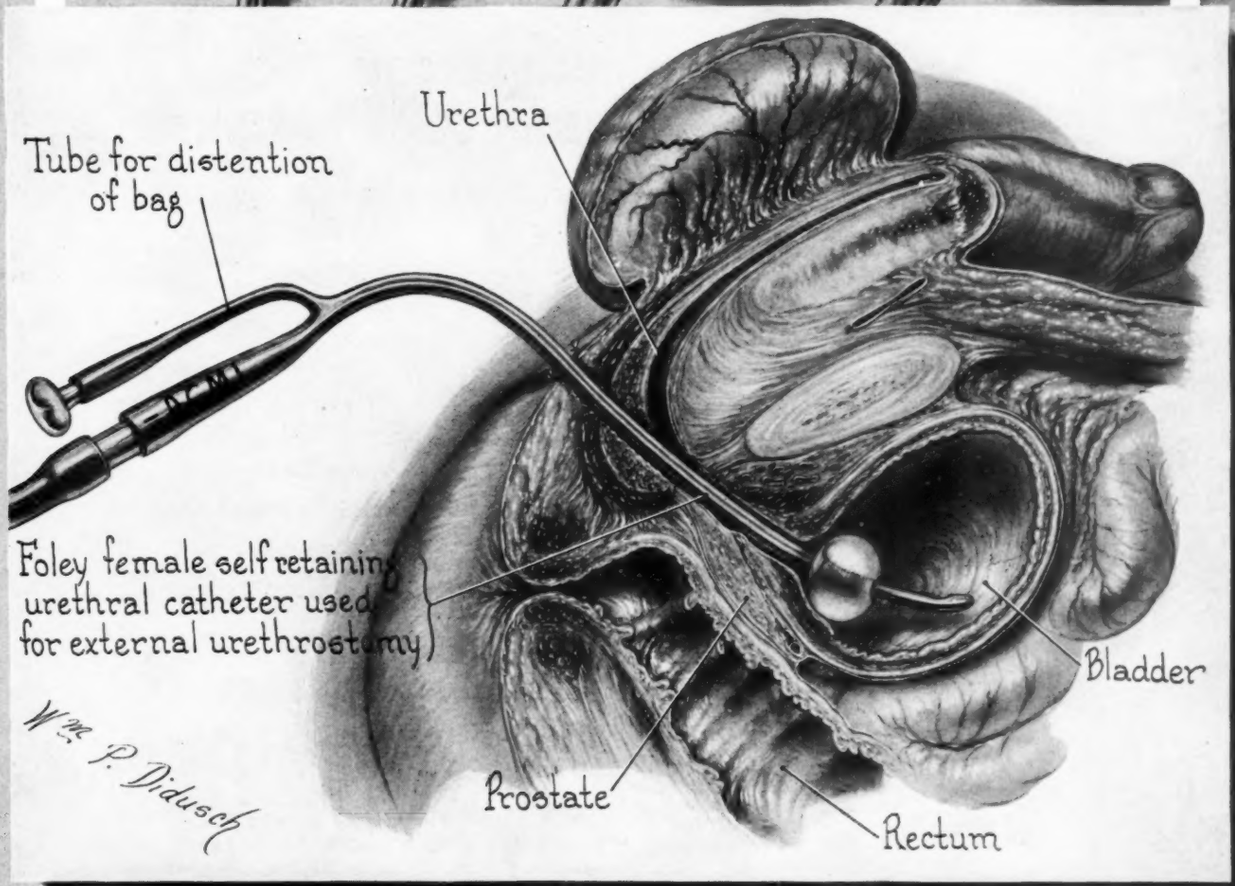
*Simplified dosage . . . superior Sulfonamide*

*for the finest*

## *HEMOSTATIC BAG CATHETERS*

*specify*

## *A.C.M.I.*



*See your surgical dealer or write for catalogue No. 14*

ESTABLISHED IN 1900

BY REINHOLD WAPPLER

FREDERICK J. WALLACE, *President*

**American Cystoscope Makers, Inc.**

1241 LAFAYETTE AVENUE NEW YORK 59, N. Y.

**Announcing**

*Champion-Paré*

THE FINEST OF SERUM-PROOF SILK SUTURES

**NOW AVAILABLE IN NEW NEEDLE COMBINATIONS**

- INTRA-THORACIC BLOOD VESSEL ANASTOMOSIS SUTURES
- ARTERIAL SUTURES
- EYE SUTURES
- INTESTINAL SUTURES
- NERVE SUTURES
- PLASTIC SUTURES

*SEND FOR FULL INFORMATION* on needle combinations including Mintraumatic® swaged needles. Gudebrod Bros. Silk Company, Inc. 225 West 34th Street, New York 1.

**CHAMPION-PARÉ SERUM-PROOF SILK SUTURES**

by *Gudebrod*

ALSO MAKERS OF DERMAL, COTTON AND OTHER CHAMPION SUTURES

# from *billions* to *nothing* in 5 days

Billions of organisms inhabiting the normal intestinal tract can be completely eliminated in about five days with THALAMYD,® the new enteric sulfonamide.[1] This ability of THALAMYD to sterilize the gut has great significance in the preoperative preparation of patients for elective intestinal surgery as the drug is not absorbed into the blood stream in appreciable amounts. It is, therefore, nontoxic.

In specific dysenteries caused by Shigella and other susceptible pathogens, THALAMYD is also powerfully antibacterial, acting against organisms within the bowel wall.

In chronic ulcerative colitis, THALAMYD is indicated for eliminating secondary bacterial invaders which often prevent or delay healing.[2]

# THALAMYD

(Phthalylsulfacetimide)

THALAMYD Tablets containing 0.5 Gm. (7.7 gr.) of phthalylsulfacetimide per tablet. Bottles of 100 and 1000 tablets.

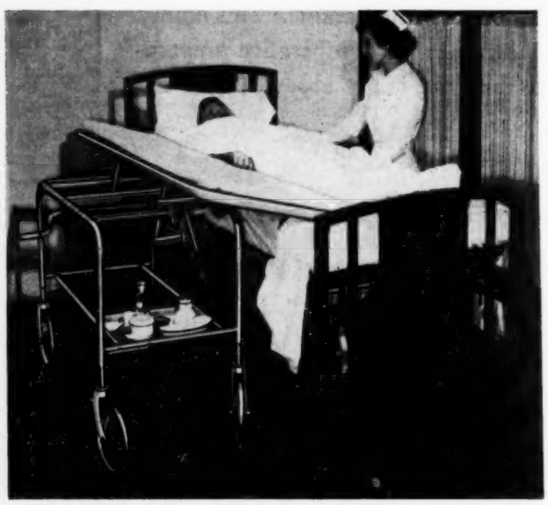
(1) Henderson, E., and Seneca, H.: Am. J. Digest. Dis. *16*:372, 1949.
(2) Heineken, T. S., and Seneca, H.: Rev. Gastroenterol. *15*:611, 1948.

Schering CORPORATION · BLOOMFIELD, NEW JERSEY

# Outside the Ivory Tower

THE Hausted Manufacturing Company of Medina, Ohio, has announced the development of a completely new type wheel stretcher for transporting patients in hospitals. "We have long been aware," said Mr. Hausted, President of the Company, "of the very real difficulties encountered by hospital staffs when moving patients from stretcher to bed. A really heavy patient can require the services of as many as five attendants. Frequently, nurses suffer severe back strain and other injuries as a result. In setting about to solve this problem we were equally concerned about another serious result of improper transportation equipment, injury to patients after delicate operations."

"In developing the Easy-Lift Stretcher," Mr. Hausted continued, "we have designed a unit that requires the services of only one attendant to move even the heaviest patient. The stretcher does all the work. The Easy-Lift also provides maximum safety for the patient."



AN operation on the aortic valve, first of its kind in medical history, was recently performed successfully at Episcopal Hospital of Philadelphia, Pennsylvania. A special instrument designed by the surgeons and made by George P. Pilling & Son Co., 136 year old internationally known surgical instrument house, was used to force open a diseased valve which would not open and close fully. The instrument, made of stainless steel, is still so new that it has no name although Pilling workmen call it an aortic valve dilator.

THE eighth annual session of the Yale Summer School of Alcohol Studies will be held at Yale University from July 8th to August 4th, 1950, Dr. Howard W. Haggard, Director of the Yale Laboratory of Applied Physiology, announced. This year, Dr. Haggard pointed out, a new emphasis will be placed upon the particular problems of alcoholism in industry, with a special workshop for those engaged in personnel work. During the year the Yale physiologist explained, the Section on Alcohol Studies has developed an educational program for industry since the subject of alcoholism in industry has assumed increasing importance. The Yale program is now in operation in Wisconsin, with the cooperation of the Wisconsin Bureau of Alcoholic Studies. Before the summer session begins, he added, two further studies will have been completed. They are the following: the occupational status and history of more than 2,000 patients of alcohol clinics and the problems encountered by union stewards.

Registration for the summer session will take place on Saturday and Sunday, July 8th and 9th, with the first lecture and a reception planned for the evening of July 9th. Professor Elvin M. Jellinek, Research Associate in Applied Physiology at Yale, will direct the school. He will be on leave from the Yale Institute of Alcohol Studies of the Southwest for this purpose.

LIFE is longest in the English-speaking and Scandinavian countries, women live longer than men practically everywhere in the world except India and Russia is at least a generation behind the United States in longevity.

*(continued on page 40)*

for the most delicate tissues

Johnson's

# ANESTHETIC LUBRICATING JELLY

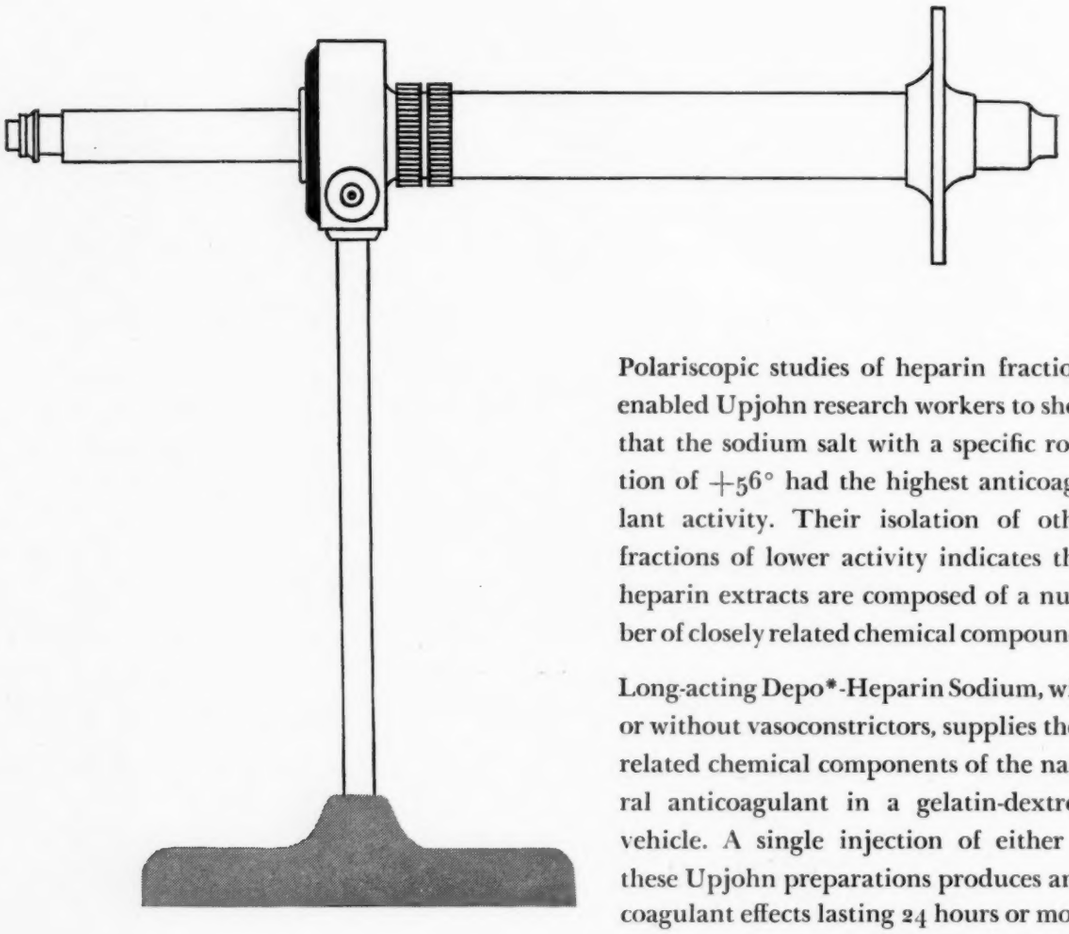
endoscopy combined anesthetic-lubricant action facilitates cystoscopy, proctoscopy and other endoscopic procedures.

anorectal pain relieves anal and rectal pain—especially valuable postoperatively. Each package contains an anorectal applicator.

burns protective anesthetic dressing for painful first and second degree burns.

Johnson & Johnson

# $[a]_D^{25} + 56°$



Polariscopic studies of heparin fractions enabled Upjohn research workers to show that the sodium salt with a specific rotation of $+56°$ had the highest anticoagulant activity. Their isolation of other fractions of lower activity indicates that heparin extracts are composed of a number of closely related chemical compounds.

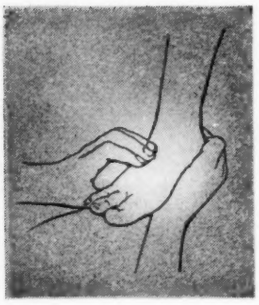
Long-acting Depo*-Heparin Sodium, with or without vasoconstrictors, supplies these related chemical components of the natural anticoagulant in a gelatin-dextrose vehicle. A single injection of either of these Upjohn preparations produces anticoagulant effects lasting 24 hours or more. Prompt action and ready controllability distinguish their clinical use in treatment of thromboembolic disease.

Further improvements in methods of purification and assay now make Depo-Heparin preparations available in full clinical supply.

*Trademark, Reg. U. S. Pat. Off.

**Upjohn** ***Medicine . . . Produced with care . . . Designed for health***

THE UPJOHN COMPANY, KALAMAZOO 99, MICHIGAN

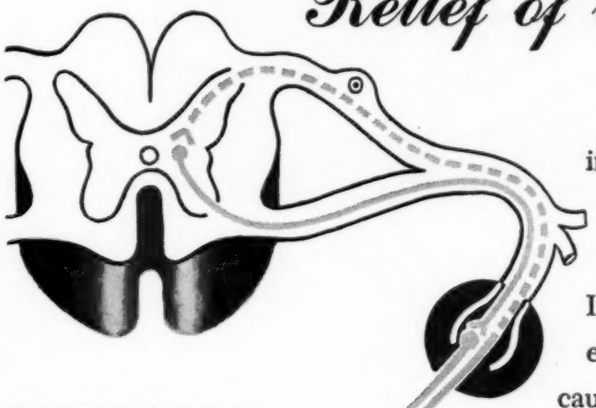


# *medical sympathectomy*

## IN PERIPHERAL VASCULAR DISEASE

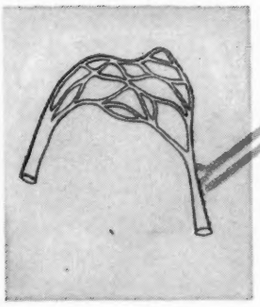
# ETAMON® CHLORIDE

## *Relief of vasospasm, pain and trophic disturbances*



in peripheral vascular disease can often be accomplished by medical block of autonomic ganglia with ETAMON CHLORIDE.

In thromboangiitis obliterans, arteriosclerosis obliterans, thrombophlebitis associated with spasm, causalgia or reflex dystrophy, Raynaud's phenomenon and related functional disorders, ETAMON CHLORIDE promotes increased blood flow to the affected extremities. "Medical sympathectomy" with ETAMON CHLORIDE is also indicated as a diagnostic procedure to determine if patients will be helped by *surgical* sympathectomy.



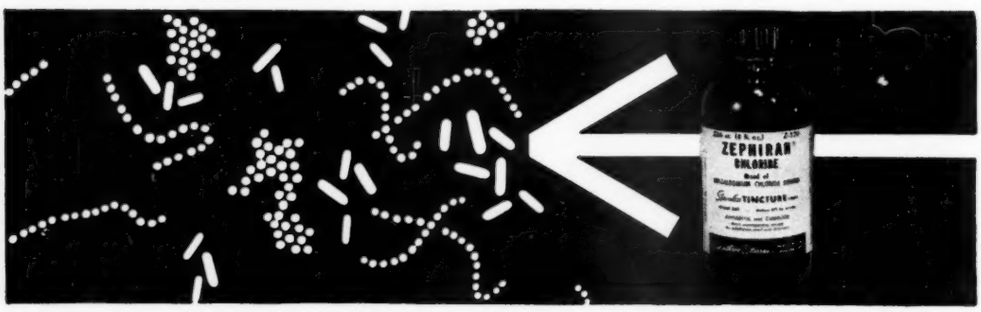
***Administration:*** Intravenously or intramuscularly. Dosage varies according to physiologic needs of the tissues. *Descriptive literature giving full details is available on request.*

**PACKAGING:** ETAMON CHLORIDE (tetraethylammonium chloride, Parke-Davis) is available in 20 cc. multiple-dose Steri-Vials®, each cc. of solution containing 0.1 Gm. of ETAMON CHLORIDE.

PARKE, DAVIS & COMPANY · DETROIT 32, MICHIGAN

MEDICAMENTA VERA · PD & CO.

***it's not enough to stun bacteria***




Simply inhibiting bacteria does not assure antisepsis. Bacteria may be revived when transferred to a suitable medium.

A thorough effect is obtained with Zephiran chloride, an antiseptic with bacteri*cidal* action. It is potent enough to kill after a few minutes' exposure hemolytic streptococcus, staphylococcus, Escherichia coli as well as other pathogens. Yet Zephiran chloride is less toxic than the mercurials.

For an antiseptic that is useful everywhere in office or hospital practice, specify

# Zephiran® *chloride*

***effective,***
***safe,***
***economical***
***antiseptic***

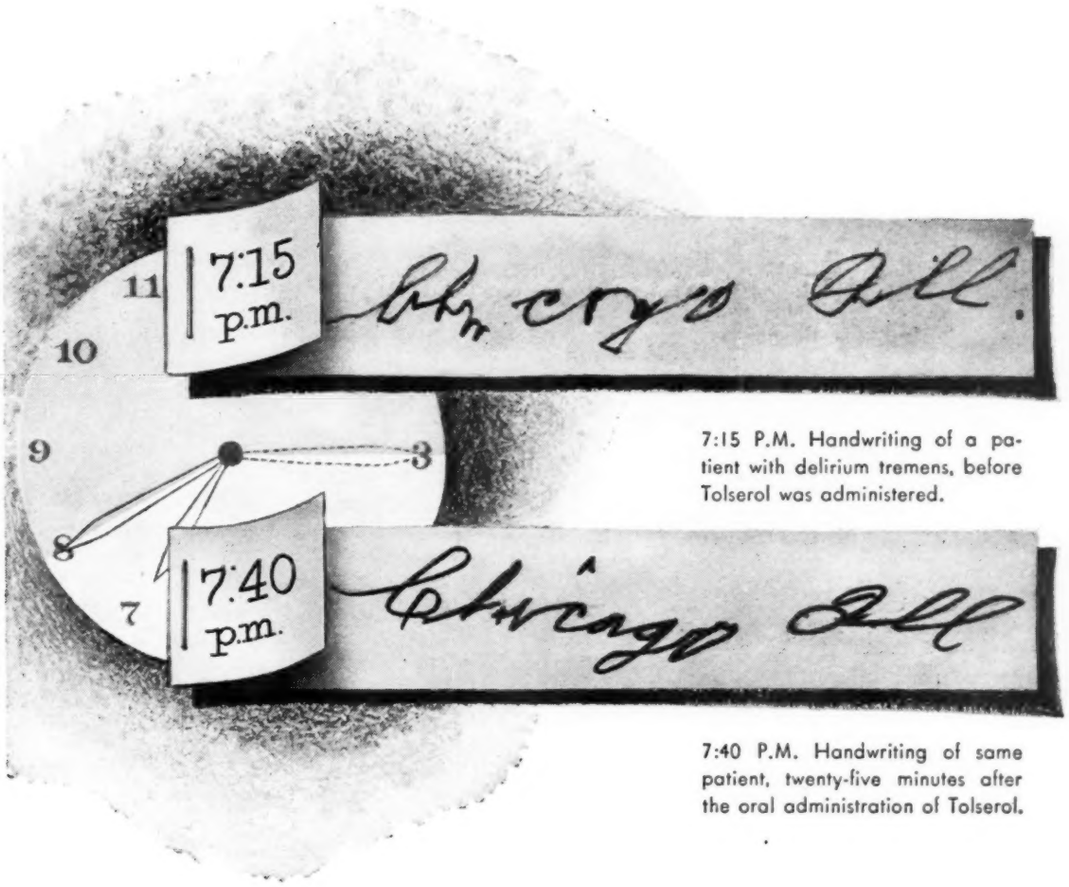
**Supplied as:**
*Aqueous Solution 1:1000, bottles of 8 oz. and 1 U.S. gallon.*
*Tincture 1:1000, tinted and stainless, bottles of 8 oz. and 1 U.S. gallon.*
*Concentrated Aqueous Solution 12.8%, bottles of 4 oz. and 1 U.S. gallon (1 oz. yields 1 U.S. gallon 1:1000 solution).*

Winthrop-Stearns INC., New York, N. Y., Windsor, Ont.

*Zephiran, trademark reg. U.S. & Canada. brand of benzalkonium chloride refined*

512 N

# *in alcoholism...*




7:15 P.M. Handwriting of a patient with delirium tremens, before Tolserol was administered.

7:40 P.M. Handwriting of same patient, twenty-five minutes after the oral administration of Tolserol.

# Tolserol

***Squibb Mephenesin* (*3-o-toloxy, 1-2-propanediol*)**

- to control tremor and quiet the patient
- for the relief of withdrawal symptoms
- to reduce or eliminate the use of paraldehyde and barbiturates
- administered orally and intravenously

**Elixir, Capsules, Tablets, Solution**

"TOLSEROL" IS A TRADEMARK OF E. R. SQUIBB & SONS

**SQUIBB**

# A Simplified Regimen for Urinary Antisepsis

# MANDELAMINE®

BRAND OF METHENAMINE MANDELATE

ACCEPTED COUNCIL ON PHARMACY AND CHEMISTRY AMERICAN MEDICAL ASSOCIATION

## —3 or 4 tablets t. i. d.

"... 1 Gm. of Mandelamine administered by mouth three or four times daily will, in the presence of normal renal function, produce and maintain antibacterial concentrations of Mandelamine in the urine."[1]

"The administration of Mandelamine maintained an acid urine without dietary restriction or other drug therapy, excepting in those cases in which urea-splitting organisms were present."[2]

**MANDELAMINE*** is indicated in urinary-tract infections such as pyelitis, pyelonephritis, nephroptosis with pyelitis, cystitis, prostatitis, nonspecific urethritis, and infections associated with urinary calculi or neurogenic bladder. **MANDELAMINE** is distinguished for its virtual absence of the side-effects and drug-fastness so commonly associated with urinary antisepsis.

## 6 OUTSTANDING ADVANTAGES

1. Wide antibacterial range — including both gram-negative and gram-positive organisms
2. No supplementary acidification required (except when urea-splitting organisms occur)
3. Little or no danger of drug-fastness
4. Exceptionally well tolerated
5. No dietary or fluid regulation
6. Simplicity of regimen — 3 or 4 tablets t.i.d.

SUPPLIED: Bottles containing 120, 500, and 1,000 enteric-coated tablets; each tablet 0.25 Gm.

**Literature and Samples on Request**

1. Scudi, J. V., and Reinhard, J. F.: J. Lab. & Clin. Med. 33: 1304 (1948). 2. Carroll, G., and Allen, N. H.: J. Urol. 55: 674 (1946).

NEPERA CHEMICAL CO., INC. *Pharmaceutical Manufacturers* NEPERA PARK • YONKERS 2, N.Y.

*MANDELAMINE is the registered trademark of Nepera Chemical Co., Inc., for its brand of methenamine mandelate.

**UNRETOUCHED PHOTOGRAPHS—SAME CHILD**

*Right leg: 40 min. after injection of* 300 cc. *saline solution* without *Hydase. Note intense swelling.*

*Left leg: 40 min. after injection of* 500 cc. *saline solution* with *Hydase. Swelling is very slight.*

**Efficiency**

**Safety**

**Patient-comfort**

Wyeth ®

**In hypodermoclysis . . .**
HYDASE has proved a remarkably efficient aid to hypodermoclyses of saline and nutrient solutions. Ideally suited for use when it is difficult or impractical to inject into veins.

**In local anesthesia . . .**
Hydase facilitates nerve block anesthesia because it diffuses the anesthetic to the desired area; no need to inject directly into the nerve.

**HYDASE***
Lyophilized Hyaluronidase

is safe: nontoxic, nonantigenic, nonallergenic. Supplied in vials of 150 and 500 TR (Turbidity-reducing) units.

*Descriptive literature to physicians on request*
*Trade Mark

Wyeth Incorporated, Philadelphia 3, Pa.

# FIRST THOUGHT IN HYPOCHROMIC ANEMIAS

# *Livitamin Capsules*

Many patients do not respond to iron salts alone taken by mouth. Some of these respond only when liver or certain vitamins are added.*

Livitamin provides the combined action of vitamin $B_{12}$, iron, B-complex vitamins and desiccated liver. It is a complete approach in the hypochromic anemia syndrome, leading to rapid correction of blood and systemic manifestations.

*J.A.M.A. 141:500 (Oct. 15) 1949.

Each capsule contains:

| | |
|---|---|
| Desiccated Liver | 0.5 Gm. |
| Ferrous Sulfate | .125 Gm. |
| (equivalent to 25 mg. elemental iron) | |
| Thiamine Hydrochloride | 3 mg. |
| Riboflavin | 3 mg. |
| Nicotinamide | 10 mg. |
| Pyridoxine | 0.5 mg. |
| Calcium Pantothenate | 2 mg. |
| $B_{12}$ | 2 micrograms |

Available on prescription in all pharmacies.
Write for sample and literature.

**The S. E. MASSENGILL COMPANY**
**Bristol, Tenn.-Va.**
NEW YORK • SAN FRANCISCO • KANSAS CITY

**$B_{12}$**
**LIVER**
**IRON**
**B-complex**

★ ALSO AVAILABLE IN ORIGINAL LIQUID FORM

SE M CO

**FOUNDATION OF ANTIANEMIA THERAPY**

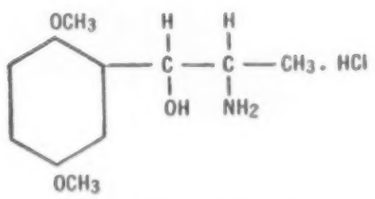
# *Announcing...*

# 'VASOXYL' BRAND

**METHOXAMINE HYDROCHLORIDE INJECTION**

a NEW superior pressor agent for safely maintaining or restoring blood pressure levels during spinal anesthesia and surgical procedures

**Discovered at**
**The Wellcome Research Laboratories**




EFFECTS: During operations under spinal anesthesia 'Vasoxyl' has been found by Dripps,[4] by Kistler and Ruben[5] and other investigators to be a superior drug for maintaining blood pressure.

During cyclopropane anesthesia Stutzman et al.[2] find 'Vasoxyl' a "safe pressor agent."

Intramuscular injection of 15 mg. 'Vasoxyl' produces a prompt and prolonged rise in blood pressure, *without central stimulation and without causing cardiac irregularities even during cyclopropane anesthesia.*

PACKAGING: 'Vasoxyl' brand Methoxamine Hydrochloride Injection 20 mg. in 1 cc., boxes of 12 and 100 ampuls.

BIBLIOGRAPHY:
1. *Baltzly, R., and Buck, J. S.: J. Am. Chem. Soc. 64:3040, 1942.*
2. *Stutzman, J.: J. Pharm. & Exptl. Ther. 97:385, Dec., 1949.*
3. *Hjort, A. M.; Randall, L. O., and de Beer, E. J.: J. Pharm. & Exptl. Ther. 92:283, 1948; de Beer, E. J., and Dews, P. B.: To be published.*
4. *King, B. D., and Dripps, R. D.: To be published.*
5. *Kistler and Ruben: To be published.*

**BURROUGHS WELLCOME & CO.** (U.S.A.) INC., TUCKAHOE 7, N. Y.

# THE SIMPLE, BLAND, STERILE *Dressing*

**FOR...**

**cover**

—non-adherent, lubricant, emollient, and *sterile* dressings for burns and wounds of traumatic or surgical origin

**pack**

—non-toxic, non-macerating, separable, and *sterile* packing material for post-operative plugs, packs, rolls, and tampons

**drain**

—non-irritating, non-sticking, pliant, and *sterile* material as wick or drain or wrap-around for tubing.

Always ready—always sterile: *VASELINE* Sterile Petrolatum Gauze Dressings are so handy and so useful wherever an emollient, non-adherent, non-irritating, and non-macerating Covering, Packing, or Drainage material is indicated, for emergency or routine application. From compact foil-envelopes, they may be cut into strips or pads of various dimensions, or folded, or used full-length. Fine-meshed absorbent gauze (44/36, Type I, U.S.P.) prevents growth of granulation tissue through gauze. The light, even impregnation with *sterile* petrolatum (white petroleum jelly U.S.P.) avoids danger of tissue maceration.

**CHESEBROUGH MFG. CO., CONS'D**
**PROFESSIONAL PRODUCTS DIVISION**
**NEW YORK 4, N. Y.**

## Vaseline
Trade-Mark ®
## Sterile Petrolatum Gauze Dressings

**In Two Convenient Sizes:**

**No. 1, UNIT ENVELOPE — 3" x 36"**
6 envelopes to the carton

**No. 2, DUPLEX ENVELOPE — TWO 3" x 18"**
6 envelopes to the carton

**IN BURNS, WOUNDS, AND MANY SURGICAL PROCEDURES**

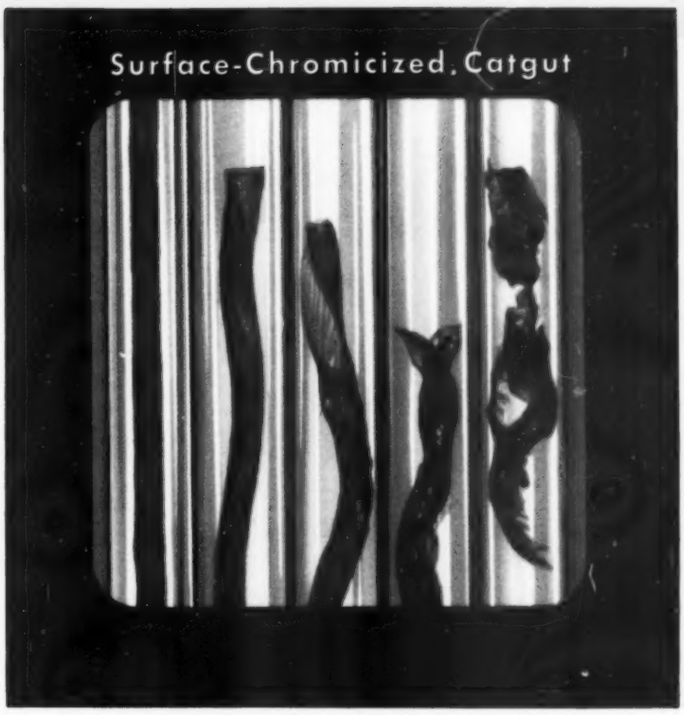
**Available through your regular source of supply**

# Surprising Differences Revealed in Catgut Digestion . . .

**THE MATERIAL:** Surface-chromicized after spinning and drying. The chrome concentration is very high in the surface layers and relatively low in the core of the strand.

**THE RESULT:** In enzyme solution, the core of most surface-chromicized catgut digests readily, leaving a hollow cylinder which separates into ribbons.

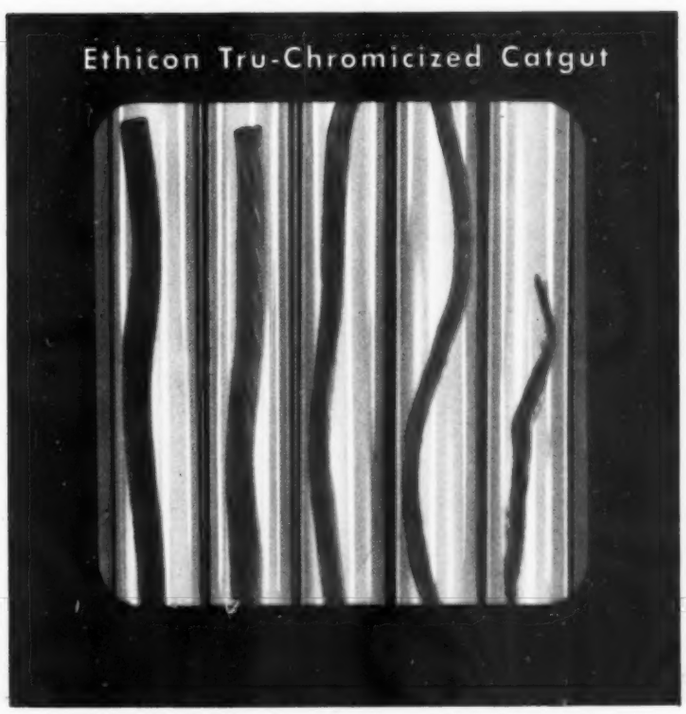
This cylinder may be excessively resistant to enzyme action and persist in tissue, frequently leading to knot extrusion.




*Enlarged photograph of five stages of digestion of surface-chromicized gut in trypsin solution.*

**THE MATERIAL:** By the Tru-Chromicizing method, individual ribbons of catgut are soaked in chrome bath *before* they are spun into strand, permitting uniform deposition and full control of chrome concentration.

**THE RESULT:** The Tru-Chromicized strand has the same chrome content from periphery to center, and hence exhibits uniform enzyme resistance throughout digestion. Ethicon's Tru-Chromicized gut digests on the surface and retains its integrity as a unified suture until digestion approaches completion. Total digestion eliminates knot extrusions.




*Enlarged photograph of five stages of digestion of Tru-Chromicized gut in trypsin solution.*

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**Bio-Sorb Powder displaces the always potentially dangerous talc.**

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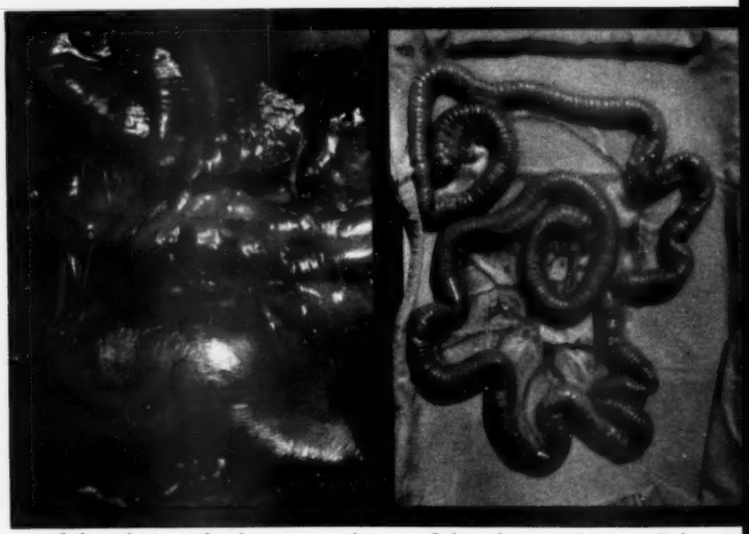

*Color photograph of a group of adhesions showing the agglutinated talc masses appearing as white flecks within the adhesions.*

*Color photograph of small bowel of a dog treated with Bio-Sorb Powder. Note complete absence of adhesions or demonstrable inflammatory reaction.*

## Glove Powder Adhesions Eliminated With New Bio-Sorb Starch Powder.

Postoperative adhesions caused by glove powder have long been a se rious concern of surgeons and operating room assistants. All publishe studies agree that talc as a glove lubricant is unsafe.

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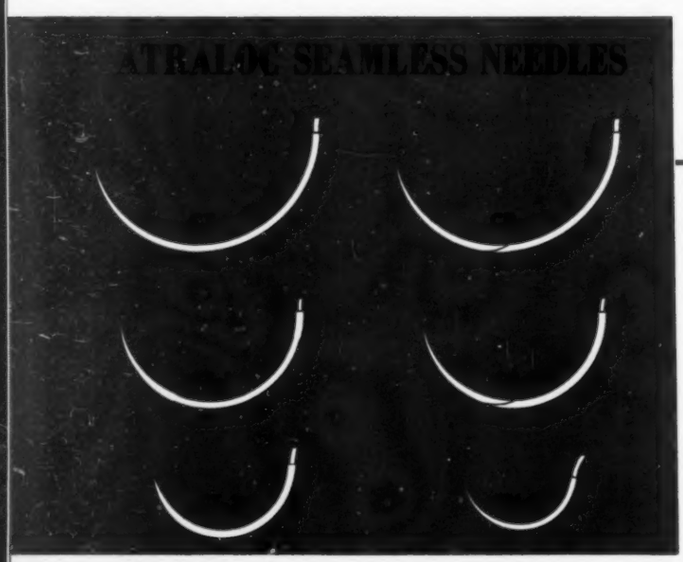


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*Fifty-ninth Year of Publication*

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# Editorial

## CHOICE OF PROCEDURE IN ACUTE CHOLECYSTITIS

THE pendulum swings almost synchronously for those who advocate immediate operation for acute cholecystitis and those who observe a waiting period. The resident in surgery and the younger men have been instilled with the idea that it is dangerous to wait for the symptoms of acute cholecystitis to subside. This is erroneous because it has been proven that all cases of acute cholecystitis will subside if given the proper treatment. For over a decade a cooling-off period for cases of acute cholecystitis has been advised. In the last 126 consecutive cholecystectomies there were no deaths in thirty-one removals of the acute bladder. No case of acute cholecystitis will ever perforate in the hospital under the care of a surgeon who understands the regimen of preoperative care. *The most important single advice is that these patients on admission must be starved. Absolutely no foods or fluids of any kind are given by mouth.* Instead, the patient is fed parenterally until the subjective and objective acute symptoms and signs subside. Within the course of a few hours a change will be noted in the symptoms and physical signs of the patient. Within twelve hours less tenderness will be noted in the region of the gallbladder, and the temperature and pulse will be lower than on admission. In the next twenty-four or forty-eight hours there will be continued subsidence of the acute symptoms.

For those who advocate immediate operation upon patients with acute cholecystitis, naturally the operation will be cholecystostomy. There is practically no need for a cholecystostomy if one waits for the symptoms to subside; the only exception is in a case of perforated gallbladder. One cholecystostomy was done recently, the first in over fifteen years, in a woman eighty-two years old admitted with a perforated gallbladder. This patient died. Another cholecystostomy was performed by the resident in surgery upon a woman seventy-four years old admitted with a perforated gallbladder. She survived.

For those who advocate the waiting period, a cholecystectomy can always be performed. This is the operation of choice. There is then little or no difficulty in recognizing the structures around the foramen of Winslow. All cholecystectomies are done from below upward and the common duct is always explored when necessary. A gangrenous gallbladder need never instill fear into the surgeon because the walls are usually thickened and this helps

to prevent perforation. Definite rules cannot be made for the waiting period. Each case should be treated on its own merits, but there is sufficient evidence that with proper care patients will be benefited with a selective waiting period in preference to an emergency operation. During this period much valuable information is obtained from the laboratory aids; in addition, the stabilization of the fluid balance will help to ensure a prompt recovery.

MOSES BEHREND, M.D.

THE Forty-ninth Meeting of The American Proctologic Society will take place at the Biltmore Hotel, Los Angeles, California, July 2nd to 5th. The guest speakers will be Dr. George T. Harding and Dr. Ralph E. Homann, Jr., of Los Angeles. An interesting program has been prepared by the Society and the papers will be presented by outstanding men in the field of proctology. The American Journal of Surgery will publish these papers in one of its forthcoming issues. For additional information address the Secretary, Dr. Wendell Green, 201 Professional Building, 1838 Parkwood Avenue, Toledo 2, Ohio.

# Original Articles

## GYNECOLOGIC MORTALITY*

WILLIAM F. FINN, M.D.
*New York, New York*

THERE are many reports on maternal mortality but few on gynecologic deaths. This is understandable for the former is far more susceptible to analysis. When death occurs in obstetrics, a well patient dies promptly of a readily recognizable cause. Some gynecologic patients are also well on admission and die from an evident cause. However, the vast majority is suffering from lethal diseases even though the immediate cause of death may differ. The intermingling of immediate causes of death such as pulmonary embolism and peritonitis with remote causes such as cancer of the ovary or cancer of the cervix, which would have proved fatal if the acute complication had not resulted in death, renders difficult the accurate determination of the primary cause of death.

A small number of patients is transferred to terminal care institutions, to other services of the hospital or even, at their request or at the insistence of relatives, to their own homes. Their omission from the statistics artificially reduces the incidence of death. This is counterbalanced in part by the inclusion of patients who were received in extremis from other services, other hospitals or their homes. All obstetric conditions including abortion, ectopic pregnancy and chorio-epithelioma have been excluded. Gynecologic mortality includes all deaths occurring on the gynecologic service, even though no gynecologic lesion was present.

The general subject of death in gynecology was discussed in 1928 by Polak and Tollefson[13] who in a frank analysis presented ninety-five deaths in 3,125 operations at the Long Island College Hospital. They concluded that 60 per cent of these deaths were preventable inasmuch as they represented violations of fundamental surgical safeguards. Peterson[12] in 1929 reported 1,734 gynecologic operations with sixteen deaths, a mortality rate of 0.58 per cent. Norris[10] in the same year reported an identical incidence of 0.57 per cent, twenty-four deaths occurring after 4,212 gynecologic operations. Greenhill[7] studied 213 deaths (3.5 per cent) among the 6,022 gynecologic operations performed at the Cook County Hospital between 1926 and 1931. Peritonitis accounted for 48.8 per cent and shock for 16.6 per cent while pneumonia and embolism caused 8.5 per cent each. Bartlett and Simmons[2] in 1932 surveyed the experience of the Free Hospital for Women from 1902 to 1932. There were 262 deaths; 95 were due to terminal malignancy, 148 deaths were in the postoperative period, a postoperative rate of 0.96 per cent. The leading causes were peritonitis, shock and pulmonary embolism. Marshall and Thompson[8] reported a mortality rate of 2.3 per cent, 183 deaths occurring in 7,812 patients from 1928 to 1934 at the Los Angeles County Hospital. Faulkner[4] in 1941 reported 147 deaths from 1930 to 1940 at the Western Reserve Hospitals. He divided his patients into two groups, namely, Group 1 which includes cancer, emergency operations and non-surgical conditions and

* From the Department of Obstetrics and Gynecology, Cornell University Medical College and the Woman's Clinic of the New York Hospital, New York, N. Y.

Group 11 which comprises all deaths following operation. Peritonitis, shock and embolism were the three chief causes. Miller[9] in 1944 reported 401 gynecologic deaths at the Charity Hospital, New Orleans; 60 per cent of these were due to cancer. He stressed the

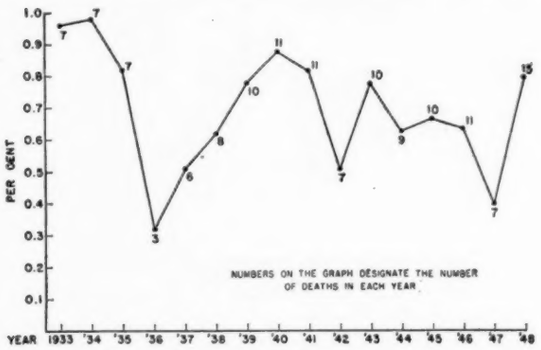


FIG. 1. Gynecologic deaths by year.

value of periodic physical examinations and the need for better education of medical students and doctors. He added parenthetically, "This is one of the most profitable exercises I have ever set myself." Truly such an analysis is a purgative for smugness.

TABLE 1
POSTOPERATIVE DEATHS

| | Number | Deaths | Per cent |
|---|---|---|---|
| Major operations | 7052 | 52 | 0.73 |
| Minor operations | 10,665 | 23 | 0.23 |
| Total | 17,717 | 75 | 0.42 |

*New York Hospital Statistics.* This report covers the seventeen-year period from September, 1932, when the New York Lying-In Hospital merged with the New York Hospital, to December 31, 1948. There were 20,617 admissions during this period. One hundred forty deaths occurred, an incidence of 1:147 or 0.68 per cent. Postmortem examinations were performed on seventy-seven or 55.0 per cent of these patients. It is further significant that cancer was present in 104 or 74.3 per cent. The annual percentage of deaths is expressed in Figure 1. The downward trend is deceptive inasmuch as it is statistically insignificant (b or trend = −.0162; σb or standard error of trend = 0.0114, −.0162 ± .0144). The rise in the last year occurred because fewer patients were sent to institutions for terminal care and because a program of radical

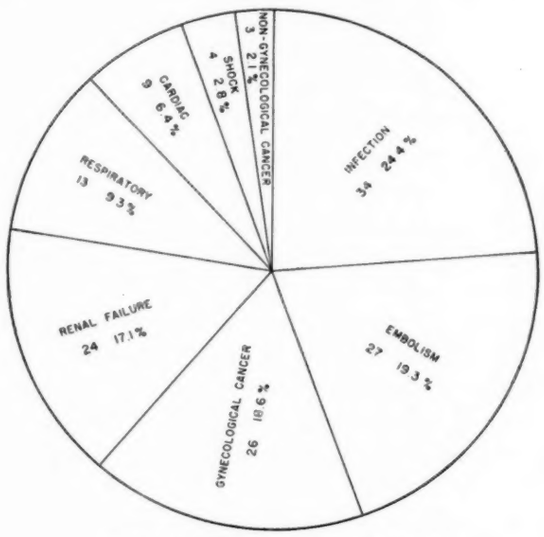


FIG. 2. Immediate causes of death.

surgery for far advanced cervical cancer was instituted.

Table 1 depicts the relationship to surgery. Seventy five (53.6 per cent) deaths occurred after major or minor operations, the remaining sixty-five (46.4 per cent) occurred without any preceding surgery.

### IMMEDIATE CAUSES OF DEATH

Each history was analyzed to determine both the immediate cause and the remote cause of death. Many cases had no remote cause and it was impossible to determine beyong peradventure of doubt the immediate cause of death in all cases.

*Infection.* Figure 2 shows the distribution of the immediate causes. Infection was the leading cause in thirty-four. All but four of these patients died of peritonitis. The causes other than peritonitis included two retroperitoneal abscesses, one ischiorectal abscess and one labial carbuncle which extended into a cellulitis of the buttock. Both retroperitoneal abscesses occurred in patients with cancer of the cervix

which had been treated by x-ray. Left psoas abscesses were present and retroperitoneal perforation of the sigmoid colon was suspected in each instance but it could not be proven.

Nine of the thirty patients with peritonitis had the source of the peritonitis in a perforated intestine. Two of these were cancer of the colon which perforated spontaneously; three were due to invasion of the bowel wall by cancer of the ovary. The bowel was perforated by an abdominal trocar at the time of paracentesis in a patient with far advanced carcinoma. Three perforations of the bowel followed radiation ulcers. This occurred once each in the treatment of cancer of the cervix, the endometrium and the ovary. One patient died of peritonitis due to rupture of a pyometra which developed subsequent to x-ray and radium therapy for cancer of the cervix. Extensive radionecrosis of the intestine was also present. Two patients died of peritonitis secondary to a ruptured appendix. The diagnosis was not suspected in one case; too much surgery was done in the other, a tube, an ovary and a cervical polyp being removed at the same time as the ruptured appendix. One fatal case of peritonitis resulted from the rupture of a liver abscess. The peritonitis was secondary to tubo-ovarian abscesses of gonorrheal origin in two instances. A tuberculous peritonitis with multiple abscesses failed to respond to extraperitoneal drainage by various routes. Peritonitis followed the spontaneous perforation of a multilocular pseudomucinous cyst once. In another instance there was perforation of an infected ovarian cyst, the correct nature of which could not be determined even at autopsy. Peritonitis followed urinary contamination of the peritoneum twice. In one case a ureter was cut at the time of hysterectomy. Despite the immediate febrile course this was not suspected and a second exploratory laparotomy was not done. The other case followed the avulsion from the bladder of a previously implanted ureter. Seven instances of peritonitis were associated with malignant disease, namely cancer of the ovary in three instances, cancer of the endometrium twice, cancer of the cervix once and sarcoma of the uterus once. Perforation of the uterus although suspected in two cases could not be proven. Fatal peritonitis followed laparotomy for myomas and for sarcoma of the uterus in once instance each. Peritonitis also resulted from the inadvertent opening of the peritoneum during a radical inguinal node dissection.

Certain errors recur in the management of these patients. Admission was delayed in many instances; this was chiefly by the patient but occasionally by the referring physician or by the admitting officer. Adequate history was not elicited in some patients. Sufficient attention was not given to the story of bowel disturbances hence the presence in this group of non-gynecologic patients such as those with cancer of the colon or with ruptured appendix. Diagnosis was delayed in some instances thus preventing the administration of proper therapy. The presence of pelvic masses such as ovarian cysts or myomas occasionally confused the detection of an associated peritonitis. Inadequate preoperative work-up resulted in incorrect diagnoses. The attempts at drainage either by colpotomy or an abdominal extraperitoneal approach were at times too late. Postirradiation necrosis of the bowel resulted in retroperitoneal abscesses in two patients and in peritonitis in three patients. Failure to dilate the cervix after radium therapy in one patient resulted in a pyometra which ruptured, resulting in fatal peritonitis.

Although it is realized that a certain percentage of error is inevitable, attempts are now made to suspect peritonitis early and to treat it promptly. Some of these deaths occurred before the use of sulfonamides, many in the prepenicillin stage and virtually all in the prestreptomycin era. Adequate preliminary cystoscopy, proctoscopy, pyelograms and barium enema are stressed. The bowel is sterilized by sulfathalidine and diet if there is any possibility of intestinal surgery. The bowel is decom-

pressed prior to paracentesis when dilated loops of intestine complicate ascites. Irradiation necrosis of bowel is considered when patients who have been treated for cancer with x-ray present obscure abdominal symptoms. Drainage is instituted more promptly. Antimicrobial agents are used *en masse* or as indicated by cultures.

*Embolism.* The immediate cause of death in twenty-seven patients (19.3 per cent) was embolism, thromboembolism in twenty-five and air embolism in the remaining two. Both air embolisms resulted in sudden death on the operating table during the performance of tubal insufflation for sterility. A curettage was performed in each instance. One patient was in the tenth day of the menstrual cycle, the other in the twenty-first day. It was thought that in each instance carbon dioxide gas was introduced into the uterine cavity at a pressure higher than recorded by the pressure gauge. As recorded elsewhere[5] insufflations are now performed only in the first half of the menstrual cycle; curettage with its resultant trauma to the uterine sinuses is not performed simultaneously and carbon dioxide gas is insufflated by machines which by means of a safety chamber prevent direct contact with the cylinder of compressed carbon dioxide.

Fourteen of the fatal thromboembolisms occurred after laparotomy. These varied from as early as two days to as late as twenty-one days postoperatively, the average being about eleven days. Three fatal thromboembolisms followed major vaginal operations. These occurred on the thirteenth, fourteenth and nineteenth days postoperatively. Half of the aforementioned seventeen cases happened on the first day out of bed, which prior to early rising was usually the eleventh postoperative day. Eight patients died of emboli without any antecedent operation. Fifteen of these emboli arose in thrombophlebitis of the legs, four in pelvic thrombophlebitis and six in undetermined sites. Fifteen of these patients had cancer as follows: nine in the ovary, three in the endometrium, two had sarcomas of the uterus and one had cancer of the colon. Two patients had unsuspected pelvic inflammation, one an endometritis and the other an inflammatory ovarian cyst and a hydrosalpinx.

Three patients showed signs preoperatively which should have led to postponement of the operation; one patient had pain in the calf of the leg, one had a fever of undetermined origin for two weeks prior to operation while the third showed a marked increase in the sedimentation rate for no apparent reason. One patient who manifested pain in the calf postoperatively did not receive prompt, energetic therapy for the incipient thrombophlebitis. Another case in which fever developed immediately after operation was not diagnosed correctly until a lethal pulmonary embolism occurred. This group of fatal emboli suggests the need for a more careful evaluation of unexplained pains or fevers prior to operation. Thromboembolism should also be suspected when there is an unexplained fever in the immediate postoperative period. If a diagnosis cannot be made, the patient might be treated prophylactically as though she had an early thrombophlebitis. Since 1947 patients have been getting out of bed as soon after operation as they desire. This voluntary early rising seems to have lowered the incidence of both thrombophlebitis and fatal embolisms. The anticoagulants, both dicumarol and heparin, are used early both as treatment and as prophylaxis in indicated cases.

*Gynecologic Cancer.* The protean manifestations of gynecologic cancer were the immediate causes of death in twenty-six patients (18.6 per cent). Ovarian cancer caused fifteen deaths; nine patients died from peritoneal carcinomatosis, two from intestinal obstruction secondary to invasion of the bowel, three from pulmonary metastases and one from bony metastases. Two of the ovarian cancers were metastatic from the gastrointestinal tract, the so-called Krukenberg type. One had been treated for a gastric ulcer for the past two

years while the other had no antecedent gastric symptoms.

Three of the five patients who died of cervical cancer died from cachexia while the other two died of pulmonary metastases. One of the three deaths caused by sarcoma of the uterus was due to pulmonary metastases while the other two showed peritoneal sarcomatosis. Two patients died of cancer of the endometrium, one patient with pulmonary metastases and the other with peritoneal carcinomatosis. One patient with cancer of the vulva died of cachexia and extensive inguinal metastases.

This group of patients for the most part had far advanced cancer with an extremely poor prognosis. Many of them were admitted after they had been treated elsewhere without avail. A simple vulvectomy was performed for the cancer of the vulva. Had a bilateral groin dissection been performed, the outcome might have been more fortunate. The unreliability of clinical staging of cancer of the cervix was evidenced by the presence of pulmonary metastases which were not detected by x-ray because of small size, unusual location and error in interpretation.

*Renal Insufficiency.* Renal insufficiency was the direct cause of death in twenty-four patients, 17.1 per cent. Nineteen of these patients had cancer which caused renal obstruction as outlined in Table II. Either direct metastases of the urinary bladder or extensive peri-ureteral infiltration caused the urinary obstruction in thirteen patients. One other patient had a pyonephrosis of undetermined origin which resulted fatally. Seven patients had uremia which was not due to obstruction; one of these resulted from a hemolytic reaction following an incompatible transfusion. Three patients without gynecologic diseases were admitted through mistaken diagnoses.

A closer relationship should exist between the urologist and the gynecologist. The gynecologist in his formative years should receive sufficient training to be able to use intelligently the urologic diagnostic measures and treatments. He should recognize and institute treatment for urinary tract obstruction. He should have urologic advice and should think in terms of ureteral catheterization, nephrostomy or even nephrectomy when necessary.

TABLE II
RENAL INSUFFICIENCY DUE TO CANCER

| Location of Primary Cancer | Involvement of Urinary System | | | |
|---|---|---|---|---|
| | Total | None | Bladder Metastases | Peri-ureteral Extension |
| Cervix | 9 | 2 | 3 | 4 |
| Ovary | 4 | 2 | 0 | 2 |
| Endometrium | 4 | 1 | 2 | 1 |
| Vagina | 1 | 0 | 1 | 0 |
| Pancreas | 1 | 1 | 0 | 0 |
| Total | 19 | 6 | 6 | 7 |

*Respiratory Diseases and Anesthesia.* Thirteen patients, 9.3 per cent, died of respiratory diseases and anesthesia. Nine of these died of respiratory complications, four died of pulmonary edema and three died of bronchopneumonia. All of these deaths occurred in the presulfonamide days. Two patients died of massive atelectasis in the postoperative period. Seven of the nine patients who died of respiratory complications had cancer, four of the ovary and one each of the endometrium, tube and the urethra.

The pulmonary edema was not treated early enough and forcefully enough in two instances. Phlebotomy, tourniquets to the extremities, aminophylline, oxygen and/or helium under pressure should be used immediately. The atelectasis was diagnosed as pneumonia in both cases. Bronchoscopic aspiration might have helped.

An additional four deaths were due to anesthesia. The anesthetic agents in each case were ethyl ether and nitrous oxide. They occurred fifty, sixty, sixty and ninety minutes, respectively, after induction. Twice the respirations ceased abruptly, once the heart stopped without premonitory signs and in one instance the

respirations ceased after two short preceding episodes of apnea. The patients in two instances were difficult to relax and in the words of the anesthetist, "took a poor anesthetic." Autopsy which was performed in three instances showed hyperemia and congestion of the lungs, liver, spleen and kidneys twice and focal areas of atelectasis in the third case. Twice the surgeon urged the anesthesist to deepen the anesthesia and the anesthetist failed once to report the incipient respiratory distress.

The anesthetists now report any irregularity of the cardiac or respiratory rhythm to the surgeon who defers further operating and assists in the resuscitation of the patient. If respiratory or cardiac distress persists, the operation, if in a favorable phase, is terminated by closing all layers of the abdominal wall with through and through sutures. After the patient has recovered, the need for operation is reviewed. If it outweighs the medical complications as indicated by a thorough cardiac and respiratory study, the operation is performed at a later date. A wider range of anesthetic agents are now used. Ether, nitrous oxide and avertin were the standard modes of anesthesia fifteen years ago. Now pentothal, procaine, cyclopropane and other agents are used in addition. A combination of basal analgesia and regional block with 1 per cent procaine has been very useful in elderly patients. Gillespie[4] in 1944 estimated that the incidence of deaths due to anesthesia was 1:1000. Waters and Gillespie[14] concluded that inhalation anesthetics were safer than intravenous or spinal anesthetics.

*Cardiac Disease.* Nine patients (6.4 per cent) died from cardiac disease; two from coronary occlusion and seven in congestive failure. One patient died on the fifth postoperative day of a coronary occlusion following an oophorocystectomy, lysis of adhesions and repair of incisional hernia. The preoperative blood pressure was 210/120 and the heart showed moderate enlargement. The other patient died from a coronary occlusion on the second postoperative day after an amputation of the cervix and anterior vaginal repair. Prior to operation blood pressure had ranged about 220/100. The patient complained of severe chest pain immediately after recovery from open drop ether anesthesia and died painlessly in her sleep twenty-four hours later. Autopsy in each case showed occlusion of the coronary vessels with myocardial infarction.

Two patients, aged sixty-four and sixty-six, respectively, died of congestive heart failure while in the process of diagnostic work-up for cancer of the cervix and of the endometrium. One patient developed auricular fibrillation and died seventy days after an exploratory laparotomy for cancer of the ovary. Another died of congestive failure two days after an exploratory laparotomy for a uterine sarcoma. A fifth patient with an extensive uterine prolapse who was fibrillating and showed an enlarged heart preoperatively was subjected to an anterior and posterior repair under 1 per cent procaine anesthesia. She died of congestive heart failure on the second postoperative day. Another patient with rheumatic heart disease died while receiving a transfusion prior to surgery. Although the transfusion was slow, fatal pulmonary edema developed. The last patient died on the sixth postoperative day after an exploratory laparotomy had revealed an abdominal mass to be an aortic aneurysm.

These patients represent a group of poor surgical risks. Preoperative evaluation consists of a careful history of previous failure, abnormal rhythms or chest pain, physical examination to determine heart size, valvular deficiencies and blood pressure, electrocardiogram, chest x-ray, vital capacity, urinalysis for albumen, concentration test and other renal function tests as indicated. A medical consultant examines the patient after the aforementioned determinations of cardiac, respiratory and renal capacities. Errors in judgment will occur as evidenced by the choice of vaginal repair on the woman who was fibrillating when a pessary might have sufficed, and by

the detection of an aortic aneurysm only by laparotomy.

*Hemorrhagic Shock.* Three patients died five, twelve and sixteen hours respectively, after laparotomy from shock due to intraperitoneal hemorrhage. The respective operations were salpingo-oophorectomy for a theca granulosa tumor of the ovary, laparotomy and biopsy for inoperable ovarian cancer and, lastly, total hysterectomy and bilateral salpingo-oophorectomy for sarcoma of the uterus. The sarcoma in the last case had extended so widely that the uterine vessels could never be identified during the operation. One patient with cervical cancer died from an exsanguinating hemorrhage. Although all these had fatal diseases, serious though unavailing attempts were made to correct the shock.

All patients who are about to undergo major operations have determinations of their blood group and Rh factor. Blood is then reserved in the blood bank subject to immediate call. An infusion of ⅙ molar lactate on one limb of a Y transfusion set is started with an 18-gauge needle. Blood can be added to the opposite limb as necessary while the lactate helps to alkalinize the urine. In severe shock multiple transfusions are administered through several veins simultaneously, the flow of blood being accelerated by pressure. A "cut-down" is done if there is any difficulty in inserting a needle in a vein. Rh negative, group O blood with Witebsky substance added is used when necessary for unregistered patients who have not had determinations of blood type. It is realized that the treatment of shock is merely supportive therapy preparatory to ligation of the bleeding vessel.

*Non-gynecologic Cancer.* The last three (2.1 per cent) patients died of cancer of the bladder, cancer of the pancreas and lymphosarcoma of the pancreas and the mesenteric lymph nodes. The only point of interest is that biopsies of metastases from the cancer of the pancreas were diagnosed as cancer of the ovary, thus delaying establishment of the true diagnosis until autopsy.

REMOTE CAUSES OF DEATH

All but thirty-six of these patients had an accessory cause of death which would have proved lethal had they survived the immediate cause. These 104 patients (74.3 per cent) had various types of cancers. The

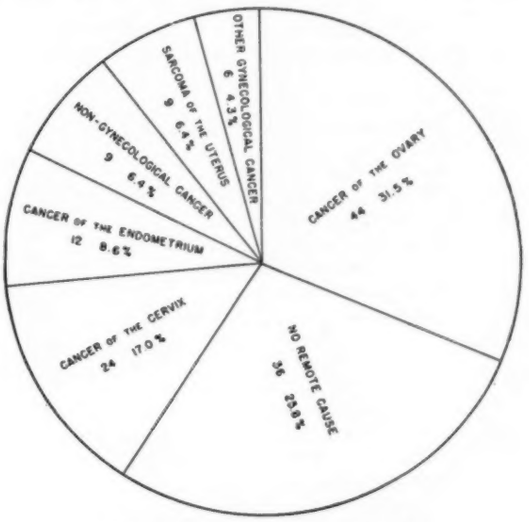


FIG. 3. Remote causes of death.

various remote causes of death are diagrammed in Figure 3.

*Ovarian Cancer.* The leading remote cause of death was cancer of the ovary which accounted for forty-four patients

TABLE III
REMOTE CAUSES OF DEATH
IMMEDIATE CAUSES OF DEATH IN PATIENTS WITH CANCER OF THE OVARY

| | |
|---|---|
| Carcinomatosis | 11 |
| Thromboembolism | 9 |
| Peritonitis | 7 |
| Renal insufficiency | 4 |
| Pulmonary metastases | 4 |
| Hemorrhagic shock | 2 |
| Intestinal obstruction | 2 |
| Bronchopneumonia | 2 |
| Atelectasis | 1 |
| Congestive heart failure | 1 |
| Anesthesia | 1 |
| Pulmonary edema | 1 |
| | 44 |

(31.5 per cent). The immediate causes of death in these patients are outlined in Table III. The pathologic types were as follows: serous cystadenocarcinoma, thirty-three; granulosa-cell cancer, five; unclassified, three; Krukenberg cancer, two and

squamous cancer arising in a dermoid cyst, one.

*No Remote Cause of Death.* The second largest group had no remote cause of death. This includes those who died of shock, anesthesia, peritonitis, etc., and who either had no other cause of death or had various degenerative diseases such as hypertensive cardiovascular disease or diabetes mellitus. Thirty-six (25.8 per cent) fell into this group. They are divided as follows: thirty-one had no cause of death other than the immediate one, two of the remaining five had diabetes mellitus, one had pulmonary tuberculosis, one had rheumatic heart disease and the last had chronic nephritis. The immediate causes of death for this group are tabulated in Table IV.

TABLE IV
REMOTE CAUSES OF DEATH
IMMEDIATE CAUSES OF DEATH WHEN NO REMOTE CAUSE PRESENT

| | |
|---|---|
| Peritonitis | 11 |
| Thromboembolism | 10 |
| Anesthesia | 3 |
| Air embolism | 2 |
| Cellulitis | 2 |
| Coronary occlusion | 2 |
| Renal insufficiency | 2 |
| Congestive heart failure | 2 |
| Pyonephrosis | 1 |
| Pneumonia | 1 |
| | 36 |

TABLE V
REMOTE CAUSES OF DEATH
IMMEDIATE CAUSES OE DEATH IN PATIENTS WITH CANCER OF THE CERVIX

| | | |
|---|---|---|
| Renal insufficiency | | 10 |
| Bladder obstruction | 3 | |
| Peri-ureteral obstruction | 5 | |
| Undetermined | 2 | |
| Peritonitis | | 4 |
| Carcinomatosis | | 3 |
| Pulmonary metastases | | 2 |
| Retroperitonel abscess | | 2 |
| Congestive heart failure | | 2 |
| Hemorrhage | | 1 |
| | | 24 |

*Cancer of the Cervix.* The third remote cause of death was cancer of the cervix which was responsible for twenty-four deaths, 17.0 per cent. Squamous-cell cancer was present in twenty-two patients and adenocarcinoma in two patients. Table V outlines the immediate cause of death in these patients. Four died as a direct result of radiation necrosis of the bowel with subsequent peritonitis or retroperitoneal abscesses.

Studies on the causes of death in cancer of the cervix have been made by Pearson[11] in 1936, Auster and Sala[1] in 1940 and DeAlvarez[3] in 1947. These authors are in general agreement regarding the frequency of uremia, sepsis, hemorrhage and pyelonephritis as causes of deaths. Auster and Sala who report the largest series, 802 deaths with 124 complete autopsies at the New York City Cancer Institute (1927 to 1938), comment, "Patients do not die directly as a result of their cancers." This is borne out by our patients in whom the immediate cause of death often differed from the remote basic cause.

TABLE VI
REMOTE CAUSES OF DEATH
IMMEDIATE CAUSES OF DEATH IN PATIENTS WITH CANCER OF THE ENDOMETRIUM

| | |
|---|---|
| Peritonitis | 4 |
| Thromboembolism | 3 |
| Renal insufficiency | 3 |
| Atelectasis | 1 |
| Carcinomatosis | 1 |
| | 12 |

TABLE VII
REMOTE CAUSES OF DEATH
IMMEDIATE CAUSES OF DEATH IN PATIENTS WITH EXTRAGENITAL CANCER

| Remote | Immediate |
|---|---|
| Sarcoma of pancreas | Sarcomatosis |
| Lymphosarcoma | Pulmonary embolism |
| Cancer of colon | Pulmonary embolism |
| Cancer of colon | Peritonitis |
| Cancer of colon | Peritonitis |
| Melanosarcoma | Peritonitis |
| Cancer of pancreas | Renal failure |
| Cancer of bladder | Carcinomatosis |
| Cancer of urethra | Pulmonary edema |

*Cancer of the Endometrium.* Twelve (8.6 per cent) patients with cancer of the endometrium died. Their immediate causes of death are outlined in Table VI. It is striking that the cancer *per se* caused death only in a few cases.

*Non-gynecologic Cancer.* This was the fifth remote cause of death, accounting for nine (6.4 per cent) deaths. The immediate and remote causes of death of these pa-

tients are tabulated in parallel columns in Table VII.

*Sarcoma of the Uterus.* Sarcoma of the uterus was the sixth remote cause of death, resulting in nine (6.4 per cent) deaths. The immediate causes of death in these patients are outlined in Table VIII which shows that half of these patients died directly because of the sarcoma while the other half died of unrelated causes. Five were myometrial, one was endometrial and three were unclassified.

TABLE VIII

REMOTE CAUSES OF DEATH

IMMEDIATE CAUSES OF DEATH IN PATIENTS WITH SARCOMA OF THE UTERUS

| | |
|---|---|
| Peritonitis | 2 |
| Sarcomatosis | 2 |
| Pulmonary metastases | 1 |
| Pulmonary embolism | 1 |
| Renal failure | 1 |
| Hemorrhagic shock | 1 |
| Congestive heart failure | 1 |
| | 9 |

TABLE IX

REMOTE CAUSES OF DEATH

IMMEDIATE CAUSES OF DEATH IN RARE GENITAL-TRACT CANCERS

| Remote | Immediate |
|---|---|
| Cancer of the vagina | Renal failure |
| Cancer of the vagina | Congestive heart failure |
| Cancer of the vulva | Cachexia |
| Cancer of the vulva | Renal failure |
| Cancer of the peri-urethral ducts | Cancer of the pancreas |
| Cancer of the fallopian tube | Pulmonary edema |

*Cancer of the Vagina, Vulva and Tube.* This last group of patients accounted for six deaths (4.3 per cent). The immediate and remote causes of death in this group are outlined in parallel columns in Table IX.

## COMMENTS

Interest in this subject was prompted by the need of material to present to classes in gynecologic pathology. The primary intention has been to present the deaths as they occurred with the utilitarian viewpoint of prevention as a secondary consideration.

The paucity of writing on the subject is striking. This is doubtless due to unsuitability of the material for statistical analysis and the natural reluctance to advertise failure.

The accurate determination of the number of preventable deaths is impossible. Twenty-eight deaths or 20 per cent were adjudged to be preventable insofar as they represented errors in judgment or technics. These were divided as follows: infection, nine; embolism, five; gynecologic cancer, one; renal insufficiency, three; respiratory involvement, five; cardiac disease, four and shock, one. These cases have been described in detail under the appropriate causes.

TABLE X

ANNUAL DEATH RATE

| Year | Patients | Infection | Embolism | | | Hemorrhage |
|---|---|---|---|---|---|---|
| | | | Laparotomy | Vaginal | Preoperative | |
| 1933–1937 | 4469 | 10 | 4 | 0 | 3 | 0 |
| 1938–1942 | 6525 | 10 | 5 | 3 | 2 | 3 |
| 1943–1948 | 9623 | 14 | 5 | 0 | 3 | 1 |
| | | 34 | 14 | 3 | 8 | 4 |
| | | | | 25 | | |

Gynecologic mortality will be reduced if (1) more attention is paid to a history of bowel disturbances; (2) peritonitis is detected when accompanying pelvic masses are present; (3) perforation of the bowel with peritonitis and/or retroperitoneal abscesses is suspected after x-ray therapy; (4) antimicrobial agents are used more promptly; (5) tubal insufflation is performed only in the first half of the menstrual cycle; curettage is not performed simultaneously; (6) early rising and movement is encouraged; (7) the patient with calf pain, unexplained fever or an increase in the sedimentation rate is treated prophylactically as though thrombophlebitis were evident; (8) renal obstruction is detected earlier; (9) the gynecologist has had urologic training; (10) pulmonary edema and

atelectasis are detected earlier and treated more promptly; (11) respiratory and/or cardiac irregularity is noted promptly by the anesthetist and heeded by the surgeon and (12) elective operations are not performed when the surgical risk outweighs the need for surgery.

Did the more general use of transfusions, advent of chemotherapy or the availability of the anticoagulants alter the mortality rates? Table x, which summarizes the occurrence by year of deaths from infection, embolism and hemorrhage, would indicate that they have not materially altered the rate from infection or hemorrhage but that there were fewer deaths from embolism.


## SUMMARY

One hundred forty deaths occurred on the gynecologic service of the New York Hospital from September, 1932, to December, 1948. This is an incidence of 1:147 or 0.68 per cent. Seventy-five deaths (53.6 per cent) occurred after gynecologic operations. Since 17,665 operations were performed during this period the incidence of postoperative mortality was 0.42 per cent. Sixty-five (46.4 per cent) of the deaths occurred without preceding operations. Seventy-seven autopsies (55.0 per cent) were performed. Cancer was the immediate or remote cause of death in 104 patients (74.3 per cent). The chief immediate causes of death were infection (24.4 per cent), embolism (19.3 per cent), gynecologic cancer (18.6 per cent) and renal failure (17.1 per cent). The leading remote causes of death were cancer of the ovary (31.5 per cent), cancer of the cervix (17.0 per cent) and cancer of the endometrium (8.6 per cent).


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# MECKEL'S DIVERTICULUM

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MECKEL'S diverticulum as a clinical entity has been known since 1589 and it was not described adequately until 1809 by Meckel.[9] According to Ladd and Gross[7] a typical case arises from 35 cm to 1 M. above the ileocecal valve and must lie on the antimesenteric side of the intestine. Other diverticuli not conforming to the above are not true cases of Meckel's diverticulum.

The lining of a Meckel's diverticulum which theoretically should be similar to that of the ileum actually has aberrant but otherwise normal mucosa from other parts of the intestinal tract in a fairly large percentage of cases (gastric, duodenal, colonic and pancreatic). Malignancy, tuberculosis, etc., may also occur.[7] Gastric mucosa is especially important as the source of bleeding which is often the only presenting sign.

As a result of the varying types of anomalies both in the size, shape and attachment of the diverticulum, as well as the aforementioned variations in the mucosa, the clinical signs may differ greatly. The picture may be that of hemorrhage, inflammation and/or intestinal obstruction.

Symptoms referable to a Meckel's diverticulum may occur at any age. Cases have been reported varying from the age of five hours[7] to seventy-seven years.[4] According to Ladd and Gross they are more apt to occur early in life (45 per cent being under two years) but this does not correspond to series in other hospitals. The sex incidence is usually reported as being twice as common in males. The incidence of Meckel's diverticulum in a large number of autopsies varied from .9 to 2.7 per cent.[4] The percentage in operative reports, however, is naturally much lower since examination of the ileum is not indicated in many abdominal operations.

Complications in a Meckel's diverticulum sufficient to cause trouble are not common as is evident by the fact that in 10,000 laparotomies only fifteen cases were reported in one series and only three in another of 14,000.[4] Reports on Meckel's diverticulum are usually of patients with complications and are not a true indication of the percentage present in the body. Haber reports twenty-three patients over an eight-year period in a general hospital. Ladd and Gross report seventy-three patients but do not give the exact number of years during which these were collected. From the previously mentioned and similar reports it is evident that the average surgeon will see few of these unless he carefully examines the terminal ileum in each case.

The clinical signs and symptoms are not pathognomonic of Meckel's diverticulum with the exception of hemorrhage which, in the absence of other causes, may lead to the correct diagnosis. Since the presence of heterotopic tissue varies from 16 to 30 per cent and not all of these contain gastric mucosa, it is evident that most patients will not be diagnosed.

The most common complications are inflammation and obstruction. The inflammation may vary from a simple catarrhal type to an acute perforation with peritonitis. The obstruction may be due to a fibrotic band, to volvulus or to intussusception, of which the Meckel's diverticulum is the starting point. Intussusception is particularly prone in a diverticulum which is short and broad and therefore tends to become inverted.[7] From this it is evident that the diagnosis will as a rule be made only at operation.

In twenty years of experience on a surgical service we have been struck by the eagerness and frequency with which our

house staff has made a primary diagnosis of Meckel's diverticulum, often overlooking the more obvious and correct one, usually appendicitis.

The operation at which a Meckel's diverticulum is found is generally for some inflammatory process, usually diagnosed appendicitis, or for intestinal obstruction of varying degrees. Thus the correct treatment is accorded the patient because of symptoms of abdominal pathologic disorder without indication of the true cause.

Analysis of all cases in ten and a half years (January, 1936, to July, 1947) in the Binghamton City Hospital (500 beds) revealed only two cases in which a preoperative diagnosis of Meckel's diverticulum was made. In one of these, reported in the obstruction group, recurring attacks of pain of an indeterminate nature caused the surgeon to mention the diagnosis. The presence of a Meckel's diverticulum, however, played little or no part in the pathologic disorder found and, therefore, the correct diagnosis was not important.

The first patient, a male aged twenty-two, (admitted October 27, 1946, discharged November 10, 1946) had a history of recurring attacks of right sided pain with passing of blood by rectum during some of these attacks since the age of seven. The attacks occurred about every six months for several years and then once every one or two years. About five months prior to this admission he had been hospitalized for an attack of abdominal pain accompanied by persistent vomiting which was relieved by the use of a Miller-Abbott tube. No blood was passed at this time. He had had a complete work-up, including gallbladder, gastrointestinal and renal studies during the various admissions with negative findings. This admission was for mild constant soreness in the right side only. There was no nausea, vomiting or blood in the stool. His temperature was normal. Blood studies were completely normal. Examination showed no cause for pain. The diagnosis of Meckel's diverticulum was made by us entirely on the history and was substantiated at operation. The diverticulum was about 2 cm. in diameter and adherent to the posterior peritoneum. Microscopically, it was lined with gastric mucosa which explained the recurrent bouts of bleeding. The persistent pain and symptoms of obstruction can only be explained on the basis of torsion about that part of the ileum which was fixed.

In this patient the correct diagnosis would have obviated a great deal of suffering as well as expense. This was the only instance in ten years in our hospital and in twenty years in our personal experience with Meckel's diverticulum in which the correct diagnosis was necessary for adequate treatment.

We next questioned the frequency of Meckel's diverticulum in cases of indeterminate abdominal pain with negative clinical findings from a diagnostic viewpoint. Two such cases were present in our series. In one, a male aged forty-nine, (admitted February 6, 1940, discharged March 11, 1940) admission was for possible gastrointestinal malignancy. He had multiple complaints such as constipation, crampy feeling in the abdomen, pain in the epigastrum after meals, etc., for a period of years. Physical and laboratory examinations were normal. An exploratory laparotomy was done which revealed a small Meckel's diverticulum as the only possible cause for his complaints. It was removed as well as a normal appendix. The microscopic report of the Meckel's diverticulum showed normal ileal mucosa. This patient has been comparatively well since then. We cannot see any direct connection between the Meckel's diverticulum and either the symptoms or the relief obtained aside from the psychic one.

The second patient, a female aged twenty-four, (admitted May 27, 1941, discharged June 8, 1941) was admitted with generalized pain in the abdomen and nausea of two weeks' duration. She was pregnant three months. At operation a shallow diverticulum with a base 2 cm. long was found and removed as well as a normal appendix. No acute pathologic disorder was present microscopically. Here

again the connection between the symptoms and the pathologic condition found is very questionable.

We cannot see any logical connection between the presence of an uncomplicated Meckel's diverticulum and abdominal pain or vague gastrointestinal symptoms. The diagnosis if made would add little to the treatment except to crystallize the desire for exploration.

Another question was whether an inactive but potentially pathologic condition of a Meckel's diverticulum could cause trouble as a result of other intestinal or abdominal causes such as ileus (postoperative), inflammation or from any other factors.

Our series presents two cases in this category. The first patient, male aged twelve, (admitted May 22, 1938, discharged June 1, 1938) was admitted for pain in the abdomen and symptoms suggesting an acute obstruction. An appendiceal abscess had been drained four months previously. At operation extensive adhesions of the omentum to the old operative scar were found. In the region of the right kidney there was a thick fibrotic band extending from the base of the diverticulum to the peritoneum in the upper lumbar region and under this a loop of ileum was caught resulting in the obstruction. The band was cut and the diverticulum was removed. The appendix was also removed and the adhesions noted before were cut. The Meckel's diverticulum showed a lining identical with stomach mucosa.

The band without a doubt was present prior to the drainage operation. Thus it must be inferred that something had changed in the area following this procedure allowing the ileum to become obstructed. The aberrant stomach tissue caused no symptoms and cannot in any way have contributed to the obstruction. In view of the delayed obstruction an acute inflammatory process could have initiated the changes.

The second patient, a male aged fifty-one (admitted October 17, 1939, discharged December 16, 1939), had had a cholecystectomy. The procedure was difficult and postoperative convalescence was stormy. A severe ileus developed which responed to the Miller-Abbott tube but which recurred upon its removal. A diagnosis of intestinal obstruction due to adhesions was made and exploration was done on the twelfth postoperative day. A Meckel's diverticulum about 2½ cm. in diameter and 3 cm. long was found from which a fibrous band led to the cecum just below the ileocecal junction. Under this band was a loop of bowel about 32 cm. long which was pinched off forming a typical closed loop of the terminal ileum. The appendix was normal.

Here again the primary Meckel's diverticulum and band had been present prior to the initial surgery. The ileus had caused enlargement of the bowel which ordinarily might slip in and out of the opening under the band. The resulting obstruction was relieved by the Miller-Abbott tube. Why this recurred after each drainage cannot be stated. It may be that the loop once caught was never completely decompressed enough to allow it to slip out.

The previously described cases demonstrate clearly that bands from any cause are potential causes of obstruction. However, in the absence of such signs we cannot see how the presence of a Meckel's diverticulum with a band can be suspected. Also, we cannot see that it matters whether the band causing the obstruction is from a diverticulum or from any other organ or cause.

A third question was whether Meckel's diverticulum is as common a cause of obstruction as one would infer from the literature.[4]

Besides the aforementioned, four other cases causing obstructive symptoms were encountered. The first patient, a female aged thirty-nine, (admitted January 29, 1945, died February 19, 1945) had a history of a similar attack three years before admission. She had a typical history of intermittent, severe abdominal cramps increasing in severity over a four-day period and

accompanied by nausea, vomiting and distention. There had been no previous operations. She was treated with several intestinal drainages by a Miller-Abbott tube with relief each time followed by recurring symptoms necessitating its reinsertion. On the twelfth day after admission she went into shock. An emergency operation demonstrated a complete severance of the ileum with several perforations on the antimesenteric area in the proximal portion. The exact pathologic disorder was not determined but the surgeon believed it to have been secondary to a Meckel's diverticulum with constriction of the bowel. This patient belonged to a cult which did not believe in surgery and refused operation until it was too late. No autopsy could be obtained.

The diagnosis of Meckel's diverticulum was unimportant in this case. Intestinal obstruction is an adequate diagnosis for warranting surgery.

The second patient, a female, aged thirty-four, (admitted February 28, 1943, discharged March 20, 1943) had a history of attacks of abdominal pain suggesting regional ileitis. At operation an acute catarrhal appendicitis was found. The terminal ileum was thickened and there was a Meckel's diverticulum about 12 cm. above the ileocecal valve. This and the appendix were removed and an ileotransverse colostomy with exclusion of terminal ileum was performed. The microscopic report showed no evidence of ileitis and no aberrant tissue in the Meckel's diverticulum. The Meckel's diverticulum obviously played no part in the pathologic disorder found at operation. Why an acute inflammation of the appendix should have been found with such a history and with no acute symptoms is a question. A follow-up of four years shows apparent complete relief. It may well have been an early ileitis; but since there was no specimen of the terminal ileum removed, it cannot be proven.

The third patient, a female aged thirty-six, (admitted January 26, 1940, discharged February 9, 1940) was admitted with a temperature of 101°F. complaining of pain in the left upper quadrant with vomiting of twenty-four hours' duration and a history of irregular bowel habits for the past week. At operation a Meckel's diverticulum was found 60 cm. from the ileocecal junction. It was 2½ cm. in diameter and 13 cm. long with the tip adherent to the mesentery forming a loop or band with the terminal 60 cm. of ileum strangulated beneath it. The Meckel's diverticulum was removed and showed a catarrhal diverticulitis. The appendix was not removed.

The fourth patient, a male aged twenty-five, (admitted May 2, 1936, discharged May 25, 1936) was operated upon for chronic appendicitis. At operation obstruction of the terminal ileum due to an adherent, strangulating type of Meckel's diverticulum was found. The microscopic report was an acute catarrhal diverticulitis.

Again, the presence of an acute condition in a patient with a chronic complaint is hard to explain. There is no question of the partial obstruction but it is hard to infer a recurring inflammatory process. Probable aggravation of the existing symptoms caused the patient to seek surgical relief.

The question whether leaving a Meckel's diverticulum behind carries with it any morbidity or mortality was next investigated. In general, it is evidently true that such is not the case. In our small series two such cases were encountered.

The first patient, a female aged sixteen, (admitted July 10, 1940, discharged August 3, 1940) had a history of intermittent attacks of right sided pain following an appendectomy four years previously. The pain had been severe and constant for several days prior to admission. At operation a Meckel's diverticulum was found about 60 cm. above the ileocecal junction. It had a broad base and tip. Some omental adhesions were bound to the old operative scar. No bowel was involved in these adhesions. The pathologic report was

chronic inflammation in a Meckel's diverticulum. The role played by the Meckel's diverticulum is subject to question but the patient has been well to date.

The appendix had been removed with a diagnosis of acute appendicitis but a carcinoid of the tip with only moderate chronic inflammation was found microscopically.

The second patient, a female aged thirty-six, (admitted March 8, 1937, discharged March 29, 1937) had had an appendectomy twelve years before admission. Her chief complaint was of pain in the operative area of five weeks' duration aggravated by being on her feet. She had been having such attacks off and on for five years but with increasing frequency in the last year. At operation dense adhesions to the old operative scar were found and a Meckel's diverticulum 3½ cm. long and 1½ cm. in diameter at the base was found about 50 cm. from the cecum. The adhesions were released and the diverticulum removed. No record of the appendectomy operation was available.

The cause of the pain is questionable. No aberrant tissue was present in the diverticulum and there were no indications of obstruction. The report was "chronic catarrhal diverticulitis in lumen and acute inflammation in serosa and subserosa." It is difficult to accept a recurring inflammatory process of this sort as an active cause in a patient with such a long history. The role of adhesions without obstruction as a cause of pain is also a debatable one. However, the patient has been relieved of her symptoms to a great extent.

The report of two cases cannot be taken as a reason for removing all Meckel's diverticuli when found. A negative reason for so doing lies in the fact that no increase in the morbidity or mortality occurred when this was done (5 patients out of twenty-four). Also, our patients cannot be the only ones with recurring symptoms after appendectomy in whom subsequent exploration demonstrates the presence of a Meckel's diverticulum.

In this respect, the somewhat contradictory statements of two authorities are of interest. Mayo and Remington[8] state, "If a normal appearing Meckel's diverticulum is found which is small, is unattached to the abdominal wall or to other organs, and has an adequate lumen, it should not be removed." Ladd and Gross[7] state, "A diverticulum which has not given rise to symptoms but which is discovered during the course of a laparotomy for some other lesion should be excised if the condition of the patient is satisfactory." The latter believe that a Meckel's diverticulum is a potential source of future trouble. Our findings lead us to side with Ladd and Gross.

The next question was the frequency of acute inflammation in a Meckel's diverticulum.

Six cases were reported clinically as acute diverticulitis. Of these only three showed advanced inflammatory pathologic disorders microscopically. Two of them were classed as acute suppurative diverticulitis and one showed a total hemorrhagic infarction of the diverticulum. The convalescence in one of these patients was stormy as obstruction occurred following a primary resection necessitating further surgery. The other three patients showed a chronic inflammatory condition pathologically.

All these patients were operated upon with the diagnosis of acute appendicitis. Five other patients were operated upon with the diagnosis of chronic appendicitis.

## COMMENTS

We have carefully analyzed twenty-four cases of Meckel's diverticulum occurring in a general hospital with 500 beds. During this period, approximately 11,000 abdominal patients were operated upon which corresponds in general with the incidence found elsewhere.

Our age incidence corresponded with that usually found in the literature being between the ages of three and fifty-seven. The usual male-female ratio was reversed, however, in that there were ten males and

fourteen females. The diverticulum was removed in all but one case when it was inverted. The appendix was also removed in all but two cases both of these being acute intestinal obstructions.

The most common causes of trouble were inflammation (six out of nineteen primary operations or 31.5 per cent) and obstruction (six out of nineteen cases or 31.5 per eent). Of the obstructive patients peritonitis developed in one with a fatal outcome. Five cases were in patients in whom the surgery was for some pelvic pathologic condition and the Meckel's diverticulum was an incidental finding. Two operations were for pain following previous appendectomy. Four other cases were classed as chronic recurrent appendicitis. There was one additional case so diagnosed which is included in the six obstruction cases. The correct diagnosis was made in only one case.

Analysis of this series as a whole is enlightening. The correct treatment was carried out in eighteen of the nineteen primary cases without regard to the correct diagnosis. The indications were for surgical intervention and a knowledge that a diverticulum was present would not have influenced the treatment. In only one case, a typical one of bleeding with symptoms which are pathognomonic of a Meckel's diverticulum, was a correct diagnosis necessary before proper treatment could be rendered.

This demonstrates that Meckel's diverticulum is an important clinical entity in the morbidity and mortality of abdominal surgery and warrants the attention given it.

However, it also substantiates our premise that the diagnosis of Meckel's diverticulum will be made most commonly in the course of an abdominal exploration for an inflammatory process, usually appendicitis or for intestinal obstruction, and that stress should be laid upon this fact in teaching. Unless there is bleeding or unless x-ray studies show its presence, the diagnosis *per se* will not be made. While the preoperative knowledge of the presence of a Meckel's diverticulum may be a diagnostic triumph, in actual practice the ability to recognize an acute abdomen is the important thing.

## SUMMARY

1. A brief résumé of the present knowledge of Meckel's diverticulum has been presented and twenty-four additional cases added to the literature.

2. The thesis that these patients will rarely be diagnosed preoperatively has been proven and the fact that these will almost invariably be found at operation for an acute abdomen, usually appendicitis or intestinal obstruction, has been demonstrated.

3. Stress should be laid upon this fact in order that the young surgeon always examines the terminal ileum for a Meckel's diverticulum in all cases of abdominal pain or obstruction in which the presenting pathologic condition does not completely answer the clinical picture.

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# MALIGNANT EPITHELIAL TUMORS OF THE SKIN OF HEAD AND NECK*

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IT is generally thought that malignant growths of the skin are best understood of all tumors of the body since they are easily accessible for careful examination, diagnosis and treatment. Material for this article was gathered from the Tumor Clinics of the University of Maryland, Johns Hopkins University and private practice. The cases from our private files were taken consecutively from January, 1930, to June 30, 1945, or a period of fifteen years. On account of the large amount of material from the teaching institutions only every fourth case was taken. Time did not permit a careful analysis of the 1,000 or 1,500 cases in these large institutional files. It was believed that every fourth case would give a fairly typical representation of the problems involved and the results obtained. So far as these two groups of cases were concerned the study is more or less a Gallup poll. This gave us a group of 840 patients as a basis for this report. The constant appearance of patients with lingering disease after months or years of various types of treatment has led us to a careful study of the reasons for failure of therapy of skin cancer. It would seem that in the early stages too little significance was attached to careful and adequate management. No patient is included without having had a positive biopsy or who had been treated under three years. It is most important in selecting treatment to differentiate between the various histopathologic types. For this purpose we have divided our cases into three general groups, namely, Group I, basal cell carcinomas, Group II, squamous cell carcinomas or epidermoid carcinomas with varying degrees of cellular differentiation and Group III, adenocystic basal cell carcinomas. This latter group arises from the sweat glands[1,13,14] or the coil glands.

Patients with basal cell carcinomas as a rule give a history of a lesion for a period of years before they become active; they remain local and frequently destroy the entire thickness of the skin, an ear, eye or erode through blood vessels producing excessive hemorrhage. However, these tumors seldom produce regional or distant metastases. On the other hand, squamous cell variety produces local and distant metastases. The third group or adenocystic basal cell carcinoma occasionally produces metastases either locally or distantly.[9] Because of their histology and cellular differentiation they are more difficult to treat or eradicate than the basal cell lesions. All three types of carcinomas may occur anywhere in the skin of the head and neck but as Figures 1 and 2 illustrate, the areas of predilection are nose, chin, eyelid and preauricular zones. (Table 1.)

TABLE 1
LOCATION OF 840 EPITHELIAL TUMORS OF THE SKIN OF THE HEAD AND NECK

| | No. of Cases |
|---|---|
| Eyelid | 94 |
| Nose | 244 |
| Cheeks | 217 |
| Forehead | 79 |
| Ears | 99 |
| Scalp | 34 |
| Chin | 14 |
| Neck | 42 |

It has been shown by numerous investigators[2,14] that individuals without much pigment in their skins or who have thin, dry skin are frequent candidates for epi-

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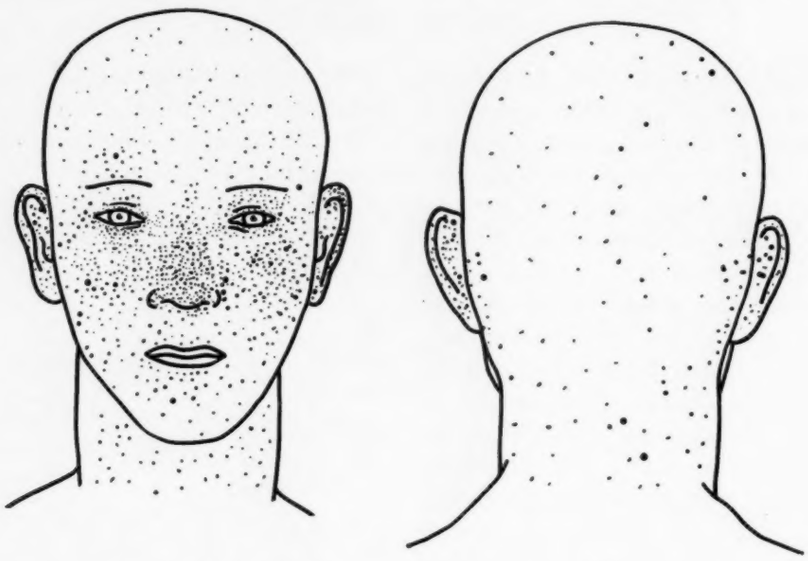
thelial malignancies. Such individuals often have multiple lesions over a period of years. Such lesions may be either basal cell, squamous cell or frequently both types may be present at the same time. In many patients areas of thickening of the skin or hyperkeratoses, if not properly treated, progress and develop into malignancies. Chemical irritants frequently act as predisposing factors or as a direct cause of these carcinomas. Recently, a man was seen in the office who gave a history of having his face repeatedly burned with creosote-arsenic mixture used for preserving railroad ties. In one of these burned areas a rapidly growing squamous cell carcinoma developed that destroyed the ala and the left side of the nose. Malignancies are prone to develop in those who work in open weather and are constantly subjected to intense sunlight like that which is seen in the southwest or northwest. Such individuals can protect their skin by using a cream when they are exposed to intense sunlight.

It is most important that premalignant lesions such as hyperkeratoses, warts, especially the type of wart that is seen in older patients, and moles should be removed. This is more important if they are on areas of the face and neck that are constantly irritated as by shaving. Hertzler[10] stated, "More wart specialists and not bold operators are what is needed to take care of early skin malignancies."



1 2

FIGS. 1 and 2. Locations of 840 malignant epithelial tumors of head and neck irrespective of histologic type. Each dot represents one tumor; the large dots, tumors over 3 cm. in diameter.

## CLASSIFICATION

*Group* 1. This group consists of basal cell epitheliomas (Rodent Ulcer; Jacobs's Ulcer; Krompecher's[5] cancers). As the name implies these lesions are supposed to develop from basal layers of the epithelium and are frequently referred to as rodent ulcers. There are two types of basal cell lesions, one beginning as a rule in a dry skin without much pigment. The lesion appears as a piling up of silver scales which when removed leaves a purplish base. Later as the lesion progresses and the scales are removed, definite bleeding occurs. (Fig. 6.) As a rule in this type of tumor there are groups or clumps of cells beneath the dermis which do not have the typical palisading encountered in the next group. In the second group there is no preliminary area of hyperkeratosis and without apparent cause or reason a firm nodule develops in the skin that tends to infiltrate rather

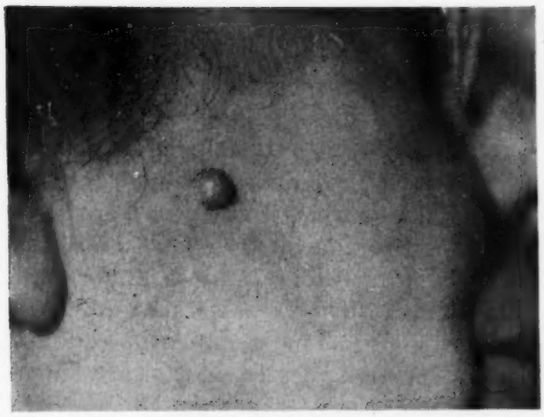


FIG. 3. Very early basal cell carcinoma of the right cheek. The patient had a flat senile wart for several years. Lately telangiectasis developed over top of it, and it began to itch and became irritated around the edges. There was no ulceration; treated 4,000 r x-ray with good result.

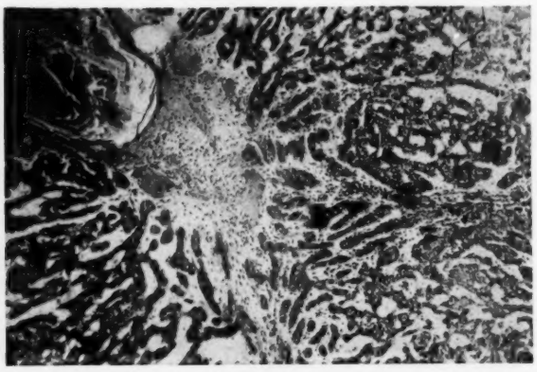
FIG. 4. Basal cell carcinoma with squamous cell changes; began in hyperkeratoses one year before. Such hyperkeratoses should be removed as a preventive measure; surgical excision, skin graft.

deeply. (Fig. 3.) As the growth enlarges telangiectases may develop. (Fig. 4.) When this stage is reached, the tumor enlarges rapidly to produce a bulky mass. In general, this grows slowly but occasionally when extending onto the conjunctiva (Fig. 5) of the eye or the mucous membrane of the nose its growth is very rapid. (Fig. 6.) This increased growth on the mucous membrane is less resistant to the growth of the tumor cells because it contains less fibrous tissue than the skin and the blood supply is more abundant. (Fig. 6.)

In certain areas as the temple or scalp if basal cell lesions are long neglected, healing may be attempted in one area while new lesions develop in others which often produce a complicated network to confuse the diagnosis. In this study of 840 patients with malignant skin lesions there were 676 basal cell or 81 per cent. Fourteen patients had two basal cell lesions, six patients had three basal cell lesions and fourteen patients had both a basal cell and a squamous cell lesion at the same time. (Fig. 7.)

*Group* II. Squamous cell carcinomas differ from the preceding group in that they develop from the prickle-cell layer. They occur less frequently there being only one hundred six cases in this series or 12.6 per cent, grow more rapidly and tend to metastasize. Histologically, they are made up of squamous cells varying in type from undifferentiated forms to more highly differentiated ones[6] showing few to many epithelial pearls. They may develop from epithelial papillomas, cutaneous horns, warts (Fig. 8) and scars, especially scars produced by repeated x-ray (Fig. 7) therapy and heat burns or broken down scars from tuberculosis, syphilis or any chronic irritation. Some have their origin in tiny hyperkeratoses which are often scarcely visible. Those squamous cell carcinomas that have developed from pre-existing lesions show as early evidence of mischief an area of hyperemia around the previous lesion. Another sign of malignant change is the appearance of firm, hard induration.

On the other hand, malignancy may occur as a primary protruding mass. These lesions frequently have an area of hyperemia around them which resembles inflammation. Secondary infection may creep in seemingly accentuating growth. Frequently, cancer nests may be observed at the border of an old ulcer appearing as gray spots in the red background. Squamous



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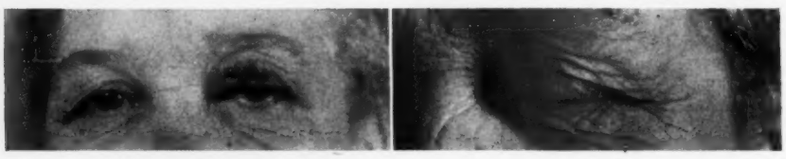


5B 5C

FIG. 5. Basal cell carcinoma of edge of upper eyelid, present six months. If conjunctiva is involved, there is very rapid growth. Removed with electrodesiccation; no recurrence in three years.

cell carcinomas are not as well circumscribed as basal cell lesions and tend to infiltrate. Sooner or later the regional or distant lymph nodes become involved.

In this series of cases three patients had two squamous cell carcinomas at the same time and one had four. The early removal of papillomas, warts, hyperkeratotic areas and old ulcers would prevent the formation of this type of cancer. Unfortunately, these tumors in the early stages are painless; but when malignancy develops, the patient sometimes notices itching around the border of the previously benign or apparently innoxious tumor. Any lesion previously benign that increases in infiltration or hardness should be considered malignant until proven otherwise. (Fig. 9.)

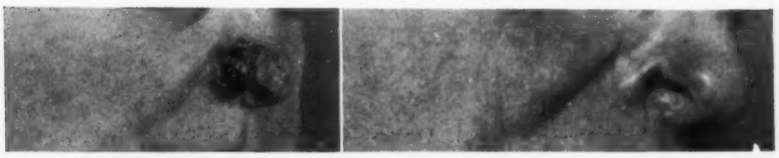
*Group* III. This group which is most interesting consists of adenocystic or adenoid epitheliomas. These tumors often begin in seborrheic areas of the skin and form globular tumors which after a time undergo proliferation and become ulcerated. (Figs. 6 and 7.) Hutchinson[7] first described them as crateriform ulcers with malignant changes. They are more malignant than basal cell epitheliomas and after a time grow quite rapidly producing extensive destruction of the skin, subcutaneous tissues and bone to form large craters and hideous ulcers. They have a tendency to metastasize. (Figs. 10 and 12.) They perhaps spring from undeveloped embryonal cells, sweat gland anlages which failed to form glands or they may form from gland adenomas, epidermoid cysts or sweat gland. (Fig. 9.) They may exist for some time before the center ulcerates. As a rule the surface becomes hyperemic and thin then ulceration begins and scabs form. These tumors look more malicious than the common basal cell carcinoma but do not grow as rapidly and form metastases as fast as the squamous cell type. The adenocystic carcinomas are an intermediate group between the basal cell and squamous cell neoplasms in clinical behavior and response to treatment.

## INCIDENCE

Males are more frequently affected than females. There were 562 males and 278 females or 67 per cent males. A study of this series of patients substantiates the fact that cancer is more frequently seen in the older age group (Table II) as one-half of these patients were sixty years of age or over and sixty-four patients were over eighty years of age. There were 538 cases that had had no previous treatment other

TABLE II
AGES OF 840 CASES

| Years | No. of Cases |
|---|---|
| 14–30 | 44 |
| 30–40 | 34 |
| 40–50 | 131 |
| 50–60 | 176 |
| 60–70 | 213 |
| 70–80 | 178 |
| 80 plus | 64 |



6A 6B

FIG. 6. Basal cell carcinoma of ala of nose; began as a small wart-like pimple seventeen years before. Six months before it ulcerated, began to grow rapidly and extended through ala of nose. Treated with 4,000 r x-ray; slight deformity of ala of nose. No recurrence three years later.

7A 7B

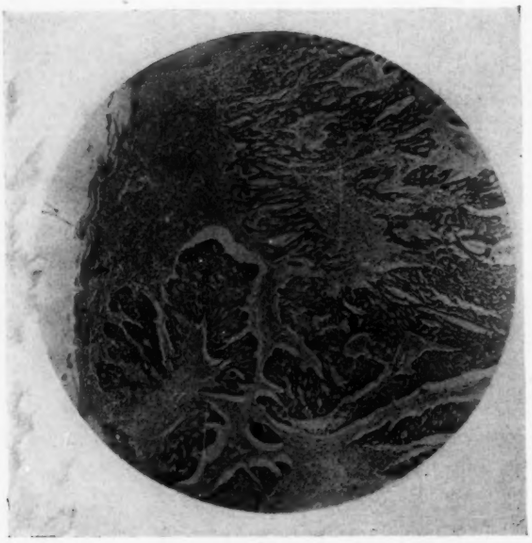
FIG. 7.S quamous cell carcinoma of right ear of six months' duration; lesion treated with 5,000 r x-ray. Regional lymph nodes were involved; radical neck dissection of the right side done. Patient had basal cell carcinoma of left ear at same time; treated with 4,400 r x-ray. No recurrence after three years.

than salves or ointments. Most of these 538 patients had had their lesions less than two years and their lesions were less than 2 cm. in diameter in the majority of cases. This is in direct contrast to 302 patients who had lesions over two years and had had either x-ray therapy, radium, electrodesiccation or local surgical excision; eighteen of the squamous cell carcinomas that had been present for over a period of two years and had had various types of treatment had lymph-node involvement and 453 of these cases showed ulceration.

In the management of tumors in general it is imperative that the attending surgeon have definite knowledge of what he is treating. Thus after careful evaluation of the patient and the lesion, a biopsy is done. It seems superfluous to stress this fact so many times but only forty-four patients of the 302 previously treated gave a history of having had a biopsy. Adequate biopsy can be done, in most instances, under local anesthesia. The value of accurate diagnosis far outweighs any theoretical danger of dissemination. It should also be stressed that the pathologist can only pass on the material submitted to him. Adequate biopsy should include some of the base of the tumor. If the tumor is small, it may be removed with biopsy forceps in its entirety and the bed properly destroyed with electrosurgery or irradiation to prevent recurrence. Careful examination should include a search for lymph-node involvement.

## TREATMENT

In planning treatment the general condition of the patient and the local lesion must be considered. In the present series



8A

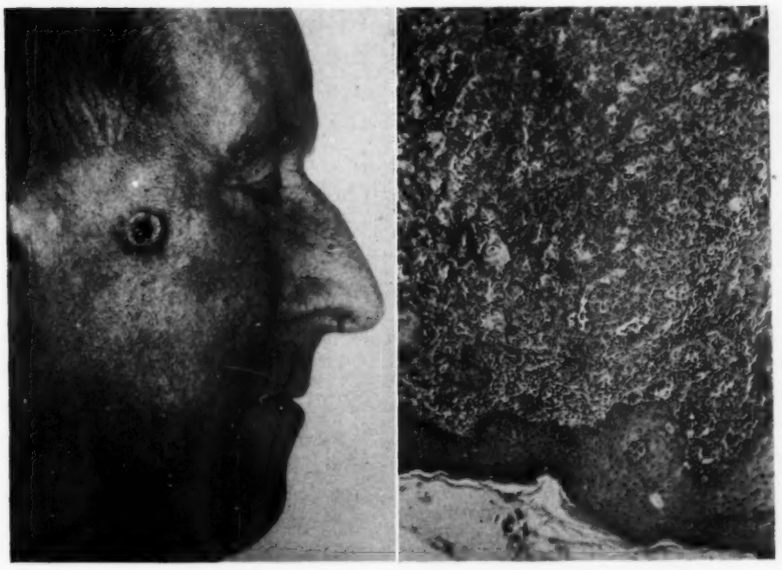
8B 8C

FIG. 8. Typical squamous cell carcinoma of bridge of nose. The patient had a flat wart for many years. During the previous eight months it became irritated, began to grow and became ulcerated. Treated with small dose of radium then removed with electrosurgery; there is moderate scarring that involves inner canthus of right eye. No recurrence in eight years.

178 patients were between seventy and eighty years of age and sixty-four were eighty or older. It is obvious that many of these patients cannot undergo extensive surgical procedures. The results obtained depend on how early they consult the oncologist after the lesion appears. He should have at his command all types of therapy that may be needed for the particular patient at hand. These skin cancers can be adequately treated with x-ray, radium, electrosurgery or surgery in the early stages or a combination of one or more in the advanced. It is not so much the type of surgery or irradiation which[9] gets results but its thoroughness.

It has been interesting to trace the development of treatment in these clinics over the past twenty-five years and to observe how the results have improved as the tumors were given more intensive therapy or more radical surgery. Too much stress cannot be laid on the axiom that skin malignancies can be cured with the first treatment series if such treatment is radical enough. If irradiation therapy or surgery is insufficient, there will be residual disease to continue to grow requiring a second, third or even more treatments in an attempt to effect a cure. It is to be remembered that residual tumor cells become increasingly resistant to each succeeding application of irradiation or surgery.[9] Therefore, it is imperative to destroy or remove every malignant cell at the first seance or at most the second.

Long-standing large lesions previously treated with multiple insufficient doses of x-ray are difficult problems. The tumor certainly is not responsive to further x-ray or radium therapy. It is better to excise widely and either cover the area with a split-thickness graft or with a pedicle graft depending on the location and depth of defect to be filled. When a pedicle graft is planned, it should be started some time prior to excision. Frequently the base from which the tumor has been removed is markedly scarred from long, inadequate x-ray therapy and has diminished vascularity from obliterating endarteritis. Such changes render it difficult for a split-thickness graft to take and pedicle grafts are necessary. Cases are commonly referred with a probable diagnosis of an x-ray ulcer or secondary breakdown of the scar which on biopsy show persistence of malignancy within the scar. These lesions should be widely excised and appropriately grafted.



9A 9B

FIG. 9. Adenocystic basal cell carcinoma, later developed squamous changes. Patient cut face with razor five months previously and lesion failed to heal. Treated with radium 1,200 mg. hr. Healed for six months; recurred; surgical excision done. No recurrence in three years.

Lesions over cartilage of the nose or ear require more intensive irradiation during the first course of treatment than lesions over more vascular areas of the cheek or scalp. Healing is excellent following such proper therapy but healing is prolonged and often associated with breakdown of the cartilage if the irradiation is repeated over a long time.

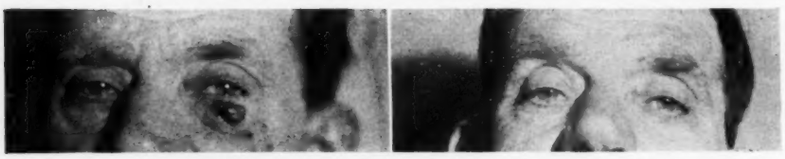
*Basal Cell Carcinoma.* The early basal cell lesions are eradicated by x-ray, radium, electrosurgery or surgery, the only problem being to give adequate treatment with a wide margin in all types of therapy. Lesions under 2 cm. in diameter and on an area other than the eyelid are controlled in most instances by irradiation. It is our custom to give 4,000 to 4,500 r units distributed over four sittings usually spaced at two-day intervals and in the case of x-ray therapy through a cone providing ½ cm. to 1 cm. margin. The broken dose method is thought to be better than one massive dose of 3,000 or 4,000 r. It is to be remembered that tumor cells divide two to four times daily depending on their degree of cellular differentiation. By dividing the total treatment into several sessions cells that are not caught in the first or second sitting will be destroyed in the third and fourth. There is usually a marked erythema or blistering persisting from a few days to three or four weeks. We believe that this mode of treatment is perhaps better than the use of radium as the x-rays are distributed over the entire tumor more uniformly. However, the lesion can be adequately treated if so desired with radium; usually eight to ten t.e.d.'s are necessary. If small the lesion can be completely eradicated with electrodesiccation, care being exercised to get well around and below it, or it can be surgically excised. Larger lesions over 2½ or 3 cm. in diameter are either treated with x-ray or surgical excision followed by skin grafting if indicated. X-ray to such large carcinomas sometimes leaves ugly scars which need subsequent correction. The fine decision between x-ray and surgical excision and plastic repair depends upon experience and upon the location of the tumor and the cosmetic result desired.

We have found small basal cell lesions on the eyelids are best removed with electrodesiccation leaving a minimum of scarring and without injury to the eye or loss

10A

with a wide margin preferably 1 cm. and carried to a total of about 5,000 to 6,000 r distributed in four to five doses at two- to three-day intervals. These lesions can also be treated with a radium plaque made to conform to the surface. Twelve to fourteen t.e.d.'s are necessary to effect a cure. The patient must be carefully examined for lymph-node involvement[12] which if present reduces the prognosis. Since metastases do not respond readily to radiation therapy even though the parent tumor may be sensitive, wide surgical excision is preferable providing the patient's general condition permits. An exception to this rule is the occasional single metastatic node which at times is controlled indefinitely by the implantation of radon seeds or radium element needles (ten t.e.d.'s are required).

Small squamous cell cancers may be treated with electrocoagulation provided a wide margin is given on all sides and the



10B 10C

FIG. 10. Basal cell carcinoma of lower eyelid, one year's duration. Hyperkeratosis three years previously; rolled up edges with ulceration in center. Treated with 4,000 r x-ray; no recurrence in five years.

of function of the eyelid and with minimal loss of cilia. They can also be treated with x-ray or radium by placing a shield over the eye in the conjunctival sac. (Figs. 10 and 11.)

*Squamous Cell Carcinoma.* Squamous cell lesions are apt to infiltrate, ulcerate and produce regional and distant metastases depending on the degree of cellular differentiation and the age of the patient. (Fig. 11.) It is an established fact that the younger the patient the more rapid his growth. The depth of infiltration must be taken into consideration[11] in planning treatment. Lesions under 2 cm. in diameter and with moderate infiltration will respond well to proper x-ray therapy. (Fig. 12.) The irradiation is given through a cone base thoroughly destroyed at the same time. Surgery is also an adequate method of treatment of these limited lesions. (Fig. 13.) It has the advantage of being a simple procedure yielding tissue for biopsy and healing in a short time. The scar in most instances is satisfactory. A skin graft is done following the surgical removal of larger tumors. It is important to remember that radical rather than conservative therapy for carcinoma of the skin is the treatment of choice. (Fig. 14.)

*Adenocystic Basal Cell Carcinoma.* The response of this form of carcinoma to irradiation lies between the more sensitive basal cell and more resistant squamous cell carcinoma being more nearly responsive to the latter. This characteristic is probably due

FIG. 11. Basal cell carcinoma of upper eyelid, present ten months; was thought to be Herpes for several months. Treated with 3,600 r x-ray with protection to eye; no recurrence in four years; little scarring of eyelid.

FIG. 12. Squamous cell carcinoma floor both nares; patient stated he had repeated fever blisters that would not heal during the previous three months. This demonstrates the importance of adequate biopsy of any lesion that persists for any period of time; treated with 4,400 r x-ray at the base of each naris.

to the greater degree of differentiation of the cells than in basal cell carcinoma. If x-ray is used, our experience necessitates that from 4,500 to 5,500 r's are necessary given in broken doses at two- to three-day intervals. A careful examination for metastases is essential. If electrosurgery or surgical excision is used, a wide margin should be given around and beneath the tumor. There is a tendency for this tumor to recur and occasionally to metastasize.

## ANALYSIS

*Analysis of 538 Cases in Which There Was No Previous Treatment Other Than Salves and Ointments before Coming to Our Clinics.* This statistical study is based on the number of patients whose diagnosis is proven by biopsy. Such examinations were made by the Department of Pathology University of Maryland, the Johns Hopkins University and by our own examinations of tissue removed from our office patients. The period covered is from 1930 to July, 1945. No case is reported which has not been followed-up for a period of three to eighteen years. One hundred thirty-four patients were not followed as they disappeared after the initial treatment or were followed for only a few months. The results of their therapy are unknown. (Tables III to VI.) There were 404 cases in this group of 538 that have been followed up to date. Therapy in these was as outlined before. In general these patients came in an early stage of their disease; most of the lesions were under 2 cm. in diameter and had been present for less than two years.

There were 321 cases of basal cell carcinomas of which 290 were treated with x-ray therapy; 280 or 96.5 per cent of the patients have remained free of disease for from three to eighteen years. Recurrences developed in 10 or 3.5 per cent; the patients remain free of disease after being treated with surgical measures. There were thirty-one cases of basal cell carcinoma that were treated with electrosurgical or wide scalpel excision. The reason for surgical therapy in these thirty-one cases was the location of the tumor or that it was rather extensive and better cosmetic results could be obtained. There were no recurrences in this group of thirty-one cases.

There were fifty-two patients with squamous cell carcinoma that were adequately followed since therapy. Twenty-six were treated with x-ray therapy; nine or 38.5 per cent recurred; twenty-six cases were also treated by electrosurgical or surgical

FIG. 13. Squamous cell carcinoma of right forehead, developed from hyperkeratosis; numerous other keratoses on face. Wide surgical excision, skin graft; no recurrences in five years.

FIG. 14. Squamous cell carcinoma right ala of nose treated elsewhere with 2,000 r x-ray. Surgically excised, later plastic reconstruction; no recurrence in three years.

excision and one recurred. (Fig. 15.) These ten recurrences were satisfactorily removed by surgery. One without local recurrence died of metastases after extensive block dissection. Perhaps it is better to treat squamous cell carcinomas over 1½ or 2 cm. in diameter by surgical measures, i.e., wide surgical or electrosurgical excision as outlined under treatment. Four patients developed metastases to the regional lymph nodes requiring radical block dissection of the neck.

There were thirty-one patients with adenocystic basal cell carcinoma fourteen of whom were treated with x-ray therapy and four developed recurrence. The recurrence was in the region of the parent tumor. There were seventeen patients with adenocystic basal cell carcinomas that were treated with electrosurgical or surgical excision, with one recurrence. There were no metastases in this group. These recurrences were treated with surgical measures with wide excision and grafted when necessary and have all remained free of disease.

TABLE III

RESULTS OF 538 CASES IN WHICH THERE WAS NO PREVIOUS THERAPY

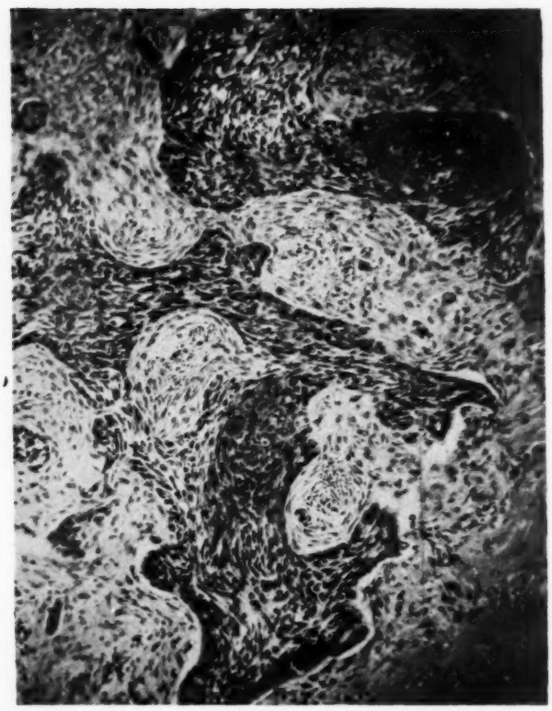
| | Basal Cell 423 | Squamous Cell 72 | Adenocystic 43 | Total 538 |
|---|---|---|---|---|
| Indeterminate group, were unable to follow-up | 102 | 20 | 12 | 134 |
| Total number studied | 321 | 52 | 31 | 404 |

TABLE IV

| | Basal Cell | Squamous Cell | Adenocystic | Total |
|---|---|---|---|---|
| Total number studied | 321 | 52 | 31 | 404 |
| Number that had x-ray therapy | 290 | 26 | 14 | 330 |
| Number treated with electrosurgery or wide surgical excision and plastic procedures when necessary | 31 | 26 | 17 | 74 |

TABLE V

| | Basal Cell | Squamous Cell | Adenocystic | Total |
|---|---|---|---|---|
| Number that had x-ray therapy | 290 | 26 | 14 | 330 |
| Primary lesions healed | 280–96.5% | 16–61.5% | 10–71.2% | 306–92% |



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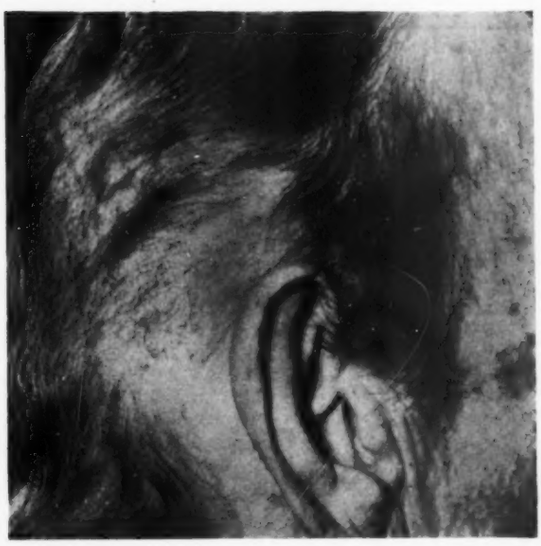


15C

FIG. 15. Squamous cell carcinoma of scalp. Began as a papillomatous wart five years before; became ulcerated, grew rapidly and became infected; palpable nodes in posterior triangle of neck. Treated with 4,000 r x-ray; lesion healed completely. No recurrence in three years.

analysis of these patients. Many of them came from a distance. Most of them had a lesion over 3 cm. in diameter and stated that their disease had been present for a period of from two to fifteen years. They gave a history of having had the following treatment, namely, x-ray in 102 patients, radium in eighty-four patients and local surgical excision in 164 patients. An endeavor was made in many instances when x-ray, radium or both had been used to find out from their physicians how much of each method and over how long a period of time it had been given. No information of value was obtained as a rule. Many of the patients stated that the lesion recurred within a short time to a few months after treatment and a large number stated that the lesion persisted throughout the treatment. When information was obtained relative to the amounts of x-ray or radium given, it was revealed that only 100 to 1,000 r had been administered over a period of a few weeks or months or extended in a few instances over a period of ten to fifteen years. Such small, inefficient applications repeated indefinitely only serve to make the cancer tolerant to irradiation.

*Analysis of 302 Cases in Which There Was Previous Therapy.* In contrast to the 538 patients who had no previous treatment there were 302 that had received therapy before they consulted our clinics. It is rather difficult to make a careful

TABLE VI

| | Basal Cell | Squamous Cell | Adenocystic | Total |
|---|---|---|---|---|
| Number treated with electrosurgery or wide surgical excision and plastic procedures when necessary | 31 | 26 | 17 | 74 |
| Primary lesions healed | 31–100% | 25–95% | 16–94% | 72–97% |
| Recurrence following surgery | 0 | 1–4% | 1–6% | 2–3% |
| Total number of recurrences | 10–3.5% | 11–21% | 5–16% | 26–6.4% |
| Number that developed metastases to regional lymph nodes following initial therapy | 0 | 5–9.6% | 0 | 5–9.6% |
| Successful treatment of recurrences by surgical measures | 10–100% | 10–90% | 5–100% | 25–96% |
| Deaths from disease | 0 | 1–4% | 0 | 1 |

TABLE VII

RESULTS OF 302 CASES IN WHICH THERE WAS PREVIOUS THERAPY

| | Basal Cell 232 | Squamous Cell 48 | Adenocystic 22 | Total 302 |
|---|---|---|---|---|
| Indeterminate group; disappeared during therapy; results of therapy unknown; 18 died of other causes | 38 | 20 | 6 | 64 |
| Total number studied | 194 | 28 | 16 | 238 |

TABLE VIII

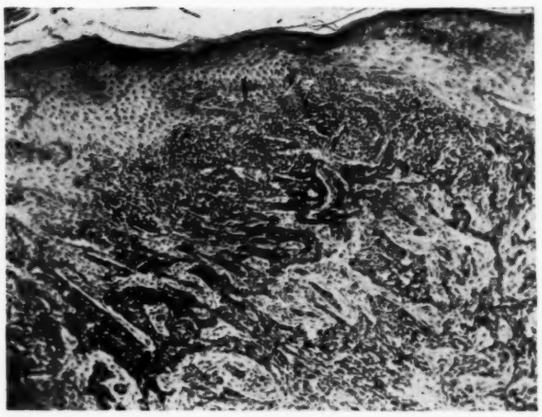
| | Basal Cell | Squamous Cell | Adenocystic | Total |
|---|---|---|---|---|
| Total number studied | 194 | 28 | 16 | 238 |
| Irradiation therapy; dosage varying greatly; given over a period of months to years | 117 | 4 | 2 | 123 |
| Control of lesion by irradiation | 66–56.4% | 0–0% | 1–50% | 67–53% |

TABLE IX

| | Basal Cell | Squamous Cell | Adenocystic | Total |
|---|---|---|---|---|
| Electrosurgical excision; skin grafts when advisable | 64 | 18 | 8 | 90 |
| Control lesion by electrosurgical measures | 48–74.4% | 13–72% | 6–75% | 67–74% |
| Wide surgical excision; skin grafts when advisable | 56 | 8 | 7 | 71 |
| Control of lesion by surgical measures | 46–82% | 5–62% | 6–85% | 57–80% |

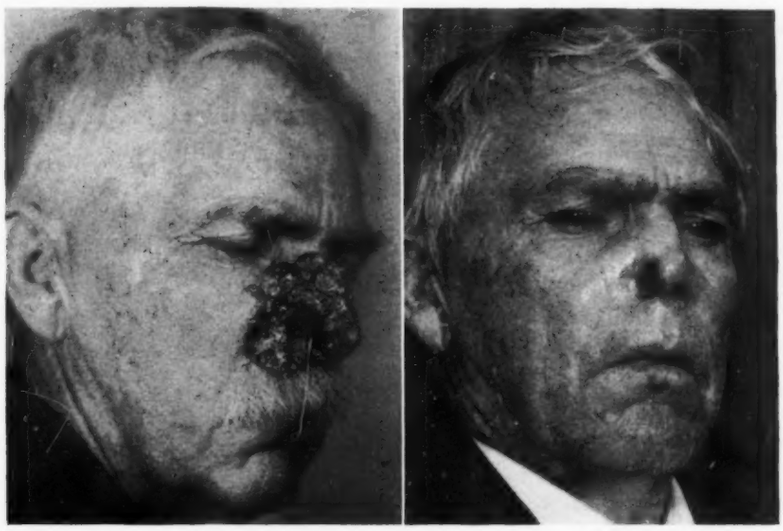
TABLE X

| | Basal Cell | Squamous Cell | Adenocystic | Total |
|---|---|---|---|---|
| Total number studied | 194 | 28 | 16 | 238 |
| Control lesions by irradiation or multiple surgical procedures | 160–82% | 18–64% | 13–81% | 191–80% |
| Patients having a continuation of the disease after multiple procedures | 28 | 1 | 2 | 31 |
| Deaths from recurrences or from operative procedures | 6 | 11 | 1 | 18–7.5% |



16A

In this group x-ray, radium, radon seeds, electrosurgery and wide surgical excision followed by plastic procedures were necessary. These modalities were used either singly or combined. Patients thought to be responsive to irradiation were so treated. Frequently, the dosage amounted to two or three times that which would have been necessary to eradicate the same type of lesion if it had been seen early. Sixty-four patients in this group were lost sight of; they either disappeared during treatment or failed to return for follow-up examination. Consequently, the results of their therapy are unknown. Eighteen died of other diseases leaving a total of 238 which forms the basis for this study. (Tables VII to X.)



16B 16C

FIG. 16. Basal cell carcinoma of nose and upper lip. Began as a papillomatous wart on nose three years before and started to grow, producing a large, ulcerating, fungating lesion. Treated with 10,000 r x-ray; large defect right naris. These defects are amendable to plastic procedures.

When the patients were first seen, eighteen had regional lymph-node involvement, six had extension into the maxilla or mandible and six others had injury to an eye which necessitated enucleation. Eight patients had radio-osteonecrosis of the maxilla or mandible, eleven had rather extensive involvement and destruction of the nose and two had almost the entire nose destroyed. Seven patients had marked defect of the ear and four had lost almost the entire ear. Extensive sloughs developed in five patients that were severe enough to erode a large vessel necessitating ligation of the external carotid artery.

Of 194 patients with basal cell carcinoma 117 were treated with irradiation. (Fig. 16.) The lesion was controlled only in sixty-six or 56.4 per cent of the cases. Electrosurgical excision was used in sixty-four and the lesion controlled in forty-eight, 74.4 per cent. Wide surgical excision was performed in fifty-six patients with favorable results in forty-six or 82 per cent. One hundred sixty, 82 per cent, of these previously

treated basal cell carcinomas were controlled satisfactorily by one or more of these types of therapy singly or in combination.

There were twenty-eight squamous cell carcinomas, four treated with irradiation, none of which were adequately controlled. Electrosurgical methods were used in eighteen cases with satisfactory control of thirteen or 72 per cent. Wide surgical excision in eight cases satisfactorily controlled five or 62 per cent. That is, there was satisfactory control of eighteen, 64 per cent, of the twenty-eight cases of squamous cell cancer.

There were sixteen patients with adenocystic basal cell carcinoma, two of whom were treated with irradiation and one favorably responded, 50 per cent. Eight were treated with electrosurgical measures with favorable results in six or 75 per cent. Seven had surgical excision, six or 65 per cent of which were favorably controlled. Thirteen of the sixteen, 81 per cent, adenocystic basal lesions were controlled with these various modalities.

Of the total 238 studied (302 minus sixty-four of indeterminate group) 191 or 80 per cent of the patients were satisfactorily controlled by these various methods of therapy. There were eighteen deaths resulting from metastases or following operative procedures, a mortality of 7.5 per cent. There were thirty-one patients that could not be satisfactorily classified as cured or having their disease eradicated. Some of these patients are still in the process of being treated; their disease had been in progress for a period of over three years. Death and continuation of the disease (eighteen plus twenty-nine) give a total failure of forty-nine or 19.8 per cent or control of the cancer in 80.2 per cent of these advanced cases.

Many of these patients are in the old age group which precludes extensive electrosurgical or surgical procedures. It became necessary then in these aged patients to try to control a tumor by irradiation which had acquired resistance to such therapy by previously prolonged inadequate doses.

## COMMENTS

During the past twenty-five years we have used various methods of treatment for skin cancer. At frequent intervals the results were evaluated and changes were made in therapy as deemed advisable. It has been found that increasing doses of x-ray and radium were necessary to effect a cure. Formerly, it was thought that 800 or 1,000 r units of x-ray were efficacious but it was soon found that there were recurrences or persistence of growth following this amount of treatment. Gradually the amount of x-ray or radium has been increased to the amount discussed in this paper.

The question is often presented by the patient or his referring physician of the danger of an x-ray burn or slough, of danger to the cartilage of the nose or ear or a probable osteonecrosis of the underlying bone. The patient is informed that it is more important to eradicate the disease than to be perturbed about the breakdown of tissue from treatment. Also, it is emphasized that heavy doses given properly and within two or three weeks' time will destroy the disease without permanent damage to the underlying cartilage. A number of patients enter the clinics each year complaining that they have an x-ray or radium ulcer lingering long after treatment. In many instances a biopsy demonstrated persistence of the malignancy indicative of insufficient x-ray or radium therapy. It is frequently explained to the patient that death rarely occurs from x-ray or radium burns of the skin from treatment of skin cancers but all too frequently death occurs from uncontrolled malignancy.

Also, biopsy must be used as a guide in following the effects of treatment, especially when healing is delayed or the irradiation scar breaks down. Delayed healing and/or subsequent scar breakdown are due to one or both of two pathologic processes. These processes are obliterating endarteritis and sclerosis from the irradiation and persistence of the cancer. Biopsy will make

the proper diagnosis. Far too often irradiation is continued to an unhealed area or is given to a broken down scab months or years after treatment on the clinical assumption that cancer remains. Such continued therapy serves only to aggravate the condition. If biopsy reveals no growth, excision and grafting if indicated are the proper procedures. If biopsy reveals persistent or recurrent growth, wider excision and plastic repair should be done. In other words it is not good therapy to reradiate secondary breakdowns in irradiation scars or to reradiate skin lesions that have failed to heal after the first or second series of treatments at most.

The main purpose of this study is the comparison of two groups of patients. The first group came without any previous surgery or irradiation therapy. Many of them had had innocuous salves but such treatment was not counted as being efficacious upon the growth. All skin cancers have small beginnings. If they can be eradicated during the early stages, it is obvious that good results will be obtained. The results in our first group bear out this contention.

On the other hand, the fact that we have been able to review 238 cases that have come after previous irradiation therapy or surgery indicates their previous treatment did not control the disease. In all of these cases this fact was proven by biopsy. The residual tumor cells had developed resistance to irradiation therapy, a condition which requires more treatment for the destruction than would have been required in the early stages of the disease. Also, much infection and pain were present. The only way to control these symptoms was by electrosurgical or surgical excision with a wide margin and the proper plastic procedures. Not only is our percentage of three-year results poorer in this group than in the primary group but there was at the time of admission and there will be more permanent disfigurement, dysfunction and prolonged disability than in the group having had no previous treatment. The economic difficulties are evident. In these previously treated patients much longer courses of therapy and often prolonged hospitalization were required.

It is obvious that many of the primary cases were early which is an important factor in yielding good results; this is one of the points of emphasis of this article.

In the previously treated group there were 117 basal cell carcinomas treated by irradiation therapy; only sixty-six or 56.4 per cent were controlled in contrast to 96.5 per cent in the primary cases. Of the fifty-one uncontrolled some were subsequently controlled by electrosurgical or surgical removal. This retreating by another method accounts for some overlapping of numbers. In other words some of these cases which were not controlled by irradiation were controlled by other methods of therapy. It is evident then that in these extensive cases which have been previously irradiated more heroic methods are needed than had been used previously. If the patient's general condition permits, all of these should have radical electrosurgical removal and suitable plastic repair. From Table III it would appear that somewhat better results were obtained with a wide surgical excision and plastic repair than with electrosurgical excision. This fact is explained on the premise that one is apt to leave too narrow a margin when removing a tumor with the electrosurgical current. The average surgeon using a scalpel will give a wider margin than with electrosurgery. If as wide a margin is given with electrosurgery as with scalpel surgery, there would be better results with the former. Also, those treated with electrosurgery were more extensive than those operated upon with the scalpel and many could not have been adequately removed with the scalpel, i.e., involvement of ear and scalp, erosion of nose, maxilla, orbit, etc. Electrosurgery leaves behind a wound sterilized by heat with less likelihood of seeding with cancer cells.

## CONCLUSIONS

1. Malignant epithelial lesions of the skin of the face, neck and scalp are frequently encountered.

2. Benign lesions such as hyperkeratoses, papillomas, senile warts and moles should be removed before malignant transformation develops.

3. An adequate biopsy should be taken of every suspicious lesion.

4. It is advantageous to differentiate between the three types of malignant lesions; by so doing proper plans of therapy are instituted.

5. X-ray, radium, electrosurgery or surgical excision are efficacious in the management of early skin cancer if given in adequate amount and a good margin around the tumor is included.

6. Careful follow-up examinations are necessary to determine the effectiveness of treatment and to watch for recurrences so that further treatment may be instituted when necessary.

7. This study has shown that a high percentage of skin cancer is curable in the early stages if properly treated. This conclusion is substantiated by comparing two large series. In the first series primarily treated by us the results were excellent; whereas, in the second series which had become resistant by previous insufficient treatment the results were poorer even when radical measures were used.

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# WOUND RUPTURE

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ONE of the most discouraging events that can occur in the work of a general surgeon is to have a difficult operative case begin to make definite progress in recovery and then receive a dismal setback in the shape of a ruptured wound. Since this specter reappears in all hospitals, we are presenting our experience in St. Francis Hospital and cite the following case to introduce the problem.

Early in 1948 the Surgical Service of St. Francis Hospital had a postoperative surgical problem in a subtotal gastrectomy. The patient, a man of fifty years, developed dyspnea, cyanosis, tachycardia and changes in the left lung field within twenty-four hours after surgery was performed. A diagnosis of atelectasis was made and the Anesthesia Service was called to intubate the patient and remove the mucus. During the course of intubation it was necessary to restrain the patient and one of us placed precautionary hands over the upper left paramedian incision for protection of the wound. Despite this step the patient gave two final and convulsive coughs and it was our unusual experience to feel the recti muscles contract in a violent manner, sense the tremendous pressure of impending doom and then, as suddenly, feel the lax depression of a wound completely rent throughout its length. This incident occurred in a laboring man who had been in good health until he had a recent gastric hemorrhage which had been adequately compensated by transfusion and other preoperative care. The operative wound had been closed with chromic catgut to the peritoneum and fascia with an additional line of interrupted No. 32 steel wire in the fascia. It was our opinion that his wound had been ruptured by purely mechanical factors and that perhaps this was the important aspect of a surgical disaster which touches all surgeons at some time in their careers.

In an attempt to evaluate this factor and those reported by other authors sixty-one cases of wound rupture which occurred between January 1, 1940, and January 1, 1948, were studied. These cases occurred during the course of 12,786 celiotomies and represent an incidence of 0.48 per cent. It is interesting to note that three wound ruptures following cesarean section are included in this series and during this period 640 sections were done giving an incidence of 0.47 per cent quite in keeping with the over-all picture. All inguinal and femoral hernias were excluded so that the study reflects work done directly within the abdominal cavity followed by closure of the wound of entrance. This rate of incidence is slightly below the average of previous reports (Table 1).

TABLE 1

| Year | Author | Total Cases | Evisceerations | Per cent |
|---|---|---|---|---|
| 1934 | Colp | 2,750 | 26 | .96 |
| 1936 | Koster and Kasman | 7,892 | 17 | .22 |
| 1936 | Glasser | 3,234 | 8 | .24 |
| 1939 | Singletown and Blocker | 9,000 | 61 | .67 |
| 1939 | Hartzell and Winfield | 6,532 | 33 | .50 |
| 1941 | Hasseltine and Bohlender | 3,179 | 15 | .47 |
| 1943 | Tashire | 8,346 | 55 | .65 |
| 1946 | Wallace | 29,180 | 137 | .47 |
| 1948 | Authors' series | 12,786 | 61 | .48 |

In reviewing the literature on this subject we have found, in common with other authors, that it is treated with a variety of terms and that an equally wide variety of conclusions has been reached concerning the underlying causes. We have chosen the term wound rupture explicitly because it

seems to imply more precisely what actually happens to the patient than do the relatively passive or languid terms of dehiscence, wound separation or splitting. Rupture bespeaks some great internal force at work which has as its final result total disorganization of established form. Since our concept of the basic problem is finally expressed in terms of internal pressures, the word rupture appears fitting.

In certain aspects of this problem we find ourselves in agreement with other writers, namely, the cases were spread evenly over the eight-year period. Only in 1946 and 1947 has there been a slight increase but this is in keeping with the greater volume of surgery being done in this hospital. The case incidence is the same. Thirty-two of our patients were in the thirty to fifty year age group, twenty-eight were between fifty and eighty years of age and only three were less than thirty years old. Most writers explain the greater incidence in the first group as being due to greater numbers in this group undergoing surgery. We agree but believe that the incidence of twenty-eight patients who were over fifty is explained by the fact that in recent years we have been bringing a greater number of these patients to surgery because of improved methods of using anesthesia, blood-volume controls and more studied pre- and postoperative care.

There were forty-one males in our series and twenty females, a 2:1 ratio previously reported by Meleney, Howes and other writers. Eighteen of our surgeons sutured the primary wounds which are reviewed and four were responsible for thirty-six of them. However, these four men undoubtedly performed a greater proportion of the surgery during this period.

There was no particular seasonal incidence in contrast with Sokolov's contention. It is our impression that hypoproteinemia is not a major contributing factor beyond the fact that a patient low in serum proteins is usually a poor risk to begin with and that the low serum protein is one point that has been overemphasized. Fifteen of our patients had preoperative serum protein determinations and eleven of these were 5.6 per cent or better. In other words eleven of our wounds ruptured and yet the serum protein level showed no significant nutritional deficiency. We do not deny that a normal serum protein level is very desirable in wound healing but we believe it is no more so than a normal hemoglobin, a normal basal metabolic rate or a diabetic under control. Given our choice of operative risks, one with a clear chest and another with pulmonary disease or a bad heart, we would not hesitate to say that the healthy patient had a better outlook for surgery. However, the actual facts of the matter seem to be that we must undertake surgical risks on all types of patients and in over 12,000 patients we are certain that there were many more than four who had subnormal serum protein levels and yet did not rupture their wounds. In short it is our belief that low proteins or poor vitamin C levels may be contributing factors but they are also only two signs that, in general, the nutritional status of that individual is poor. To conclude that wound rupture occurs only in that type of patient or that these are the major factors appears to us to be placing the blame on two findings that have received undue emphasis. In like manner the type of suture material used in the primary closure of the wounds that ruptured did not vary from that used in closing the other 12,725 cases in this series. Fifty-five cases were closed with catgut to the peritoneum and fascia, three with catgut in layers and stay sutures, two with catgut in layers and wire to the fascia and one with interrupted silk technic throughout. Silk was used on the skin in all cases. Fifty-five cases were classified as clean and six were contaminated at the time of opening. Twenty-eight were drained. (Table II.)

A review of the types of anesthesia used is equivocal. Thirty-four of the patients had spinal anesthesia with seven deaths, twenty-five received inhalation anesthesia with five deaths while two patients had

combined spinal and inhalation anesthesia with no deaths.

The average operating time for all cases was one and one-half hours, good risk patients averaging slightly less than one hour, fair risk patients averaging just over two hours and the poor risk patients one and one-third hours.

In certain aspects, however, this group differed markedly from the other celiotomies. Forty-nine had stormy postoperative courses, six had moderately stormy courses and only six could be classified as having a mild postoperative period. Forty-seven of the wound rupture cases showed postoperative temperatures of 101° to 104°F. and this degree of morbidity is far above the average in this hospital.

In this series of cases the rupture of upper abdominal incisions shows a greater incidence than that of lower abdominal incisions and this is inversely proportional to the ratio of incisions in the unruptured cases. The greater frequency of upper abdominal wound ruptures is described by nearly every writer. This finding also shows up in a review of the primary disease and the procedure accomplished. Twenty-nine cases involved the gallbladder region, the upper gastrointestinal tract or the left upper quadrant and this is not truly representative of the ratio of this type of surgery in the general volume of cases. The incisions were vertical in all instances as is the custom in this hospital.

The most striking finding in our study develops when one reviews the postoperative course of these patients. Fifty-seven patients had cough, abdominal distention or vomiting as a prominent finding. The fact that 95 per cent of the patients who

TABLE II

SURGICAL DISEASE—RISK, MORTALITY

| Disease | Good Risk | | Fair Risk | | Poor Risk | | Total |
|---|---|---|---|---|---|---|---|
| | Lived | Died | Lived | Died | Lived | Died | |
| Cholecystitis and lithiasis | 4 | .. | 5 | 1 | 1 | 1 | 12 |
| Ulcer (gastric and duodenal) | .. | .. | 4 | 1 | 1 | .. | 6 |
| Intestinal obstruction | 1 | .. | 3 | .. | .. | .. | 4 |
| Perforated ulcer | 1 | .. | 2 | .. | .. | .. | 3 |
| Appendicitis | 2 | .. | 1 | .. | .. | .. | 3 |
| Pyloric stenosis | .. | .. | .. | .. | .. | 1 | 1 |
| Carcinoma | | | | | | | |
| Stomach | .. | .. | .. | .. | 1 | .. | 1 |
| Colon | .. | .. | 2 | .. | 1 | 3 | 6 |
| Rectum | .. | .. | .. | 1 | 1 | 1 | 3 |
| Carcinomatosis | .. | .. | .. | .. | .. | 1 | 1 |
| Miscellaneous surgical | | | | | | | |
| Abdominal adhesions | 1 | .. | 1 | .. | .. | .. | 2 |
| Choledocholithiases | .. | .. | 1 | .. | .. | .. | 1 |
| Diverticulitis duodenum | .. | .. | 1 | .. | .. | .. | 1 |
| Diaphragmatic hernia | .. | .. | 1 | .. | .. | .. | 1 |
| Ruptured bladder | .. | .. | 1 | .. | .. | .. | 1 |
| Banti's disease | .. | .. | .. | .. | .. | 1 | 1 |
| Liver cirrhosis (? CA.) | .. | .. | .. | .. | .. | 1 | 1 |
| Acute alcoholic gastritis | 1 | .. | .. | .. | .. | .. | 1 |
| Uterine fibroids | 4 | .. | 1 | .. | .. | .. | 5 |
| Ovarian cyst | 1 | .. | 1 | .. | .. | .. | 2 |
| Pregnancy | 2 | .. | .. | .. | 1 | .. | 3 |
| Carcinoma of uterine fundus | 1 | .. | 1 | .. | .. | .. | 2 |
| | 18 | .. | 25 | 3 | 6 | 9 | 61 |

had ruptured wounds had one or more of these factors has impressed us overwhelmingly that changes in intra-abdominal pressure caused by one of the mechanisms cited had more to do with the eventual disruption of the wound than any other cause. In five cases involving lower midline incisions urinary retention was the significant finding as well as the other three. In the two-week old infant upon whom the Ramstedt procedure was done the record shows that he cried a great deal during his postoperative period.

In studying the records of these patients one finds that the pressure factor is not a momentary affair but rather a prolonged if intermittent application of increased tension on the wound. The nurses' notes and the progress notes on these patients make frequent mention of distracting and distressing cough, persistent vomiting or abdominal swelling that resisted attempts at deflation. This picture is in marked contrast with the postoperative picture of the average surgical patient in our hospital. Pneumonia (we believe the pathologic entity is more truly atelectasis) is reported as the villain in many of these case records in which cough and fever were prominent. The almost plaintive notes in the nurse's handwriting describe the longer than average period of agony of those who were unable to regain normal urinary function in time to relieve the pressure on their abdominal walls. The progress notes, nursing notes and finally the order for Levin tubes and suction speak volumes on the collective and individual problems of vomiting and distention.

As we see it the fresh wound with its reparative coagulum and the slender bridges of young, tender fibroblasts never quite gets a chance to set long enough to become solid and strong. One might liken it to a fighter always kept off balance by the constant jabbing of his opponent so that he never gets set for the killing blow. So with our wounds working away at repair from the moment of closure we require a comparatively quiet period of cohesion to establish the healed line. When this is prevented by protracted coughing spells, the comparatively violent changes that accompany vomiting or the divergent action of distending loops of bowel it is small wonder that when the skin sutures are finally removed the major blow has already fallen and the transmission of the increased intra-abdominal pressure to the previously protected skin edge completes the downfall of the wound, resulting in what we clinically recognize as wound rupture. It is our opinion that altogether too many of our patients exhibited one or more of these causes of increased pressure to disregard them. It would appear that our patients were at work breaking down their wounds from the first postoperative day.

No doubt there are important contributory factors to this problem and drained wounds, infected wounds and fistulas must be mentioned. Twenty-eight of the wounds were drained which is considerably above the average number of cases drained in this hospital. However, only three of these patients had mild postoperative courses but none was free of either cough, distention or vomiting.

It is our opinion, therefore, that the patient who disrupts his wound is not a special surgical problem in the sense that he is particularly deficient in certain vital substances such as proteins, vitamins, etc., that he is the victim of defective or inadequate suture material or that he has suffered unduly from anesthesia but rather that this patient is one in the general run of surgery whose postoperative course has been marked by excessive strain (the point made by Glasser) due to the previously cited causes on a fluid, self-sealing wall which never gets the same chance to become strong in the way the vast majority of surgical closures usually do.

As far as the diagnosis that a wound rupture has taken place it has been our experience that the visible evidence of either an open wound or one with omentum or bowel presenting was the principle find-

ing. Nearly half of our patients, however, had the ominous serosanguineous drainage described by nearly all the writers on this subject. In one instance the presence of this drainage on the second day after operation made one of our surgeons decide to resuture the wound on the fourth day and he described the typical findings of a ruptured wound at the second suturing. If the case had gone along until the skin sutures were removed, we believe that it would have been classed as a wound rupture on the seventh or eighth day. In other words the time of rupture of the wound has ordinarily been recorded as closely following the removal of the skin sutures and the majority of our wound ruptures occurred between the seventh and twelfth days. We think that actually the wound began to rupture much earlier and the removal of the skin sutures was much like pulling the string out of a sack and letting the contents reach the light.

Following the discovery of the ruptured wound all were resutured in the operating room. The secondary closure was almost always by means of several heavy silk or dermal through and through sutures. A few attempts to perform a secondary layered closure were made but the surgeons were almost universal in reporting their inability to define each layer. The wounds with secondary sutures healed without incident and were strong. We believe the final strength of these secondarily closed wounds was achieved because the causative factors of the wound rupture had been successfully eliminated permitting the apposed wound edges to unite in comparative peace. However, these patients averaged a much longer hospital stay than the usual surgical case.

There were twelve deaths in our series. There were no deaths in the good risk patients; three of twenty-eight fair risks succumbed and nine of the fifteen poor risks did not survive. Except for the infant with pyloric stenosis all deaths occurred in patients past middle age. One was forty-nine years old, two in the middle fifties and the remainder were between sixty and seventy-seven years of age at the time of their deaths. Except for two Miles' resections all of the deaths were of persons who had upper abdominal incisions. Seven of those who died were suffering from carcinoma, two had primary liver and spleen pathology and one had cholecystitis and lithiasis; there was one case of obstructing gastric ulcer and one case of pyloric stenosis. There is no question that the wound rupture hastened the demise of the patients but we are pleased to find that the chances of survival in a patient whose wound has broken open are four out of five and that if he is less than fifty years of age he is almost certain to recover.

Our mortality of 19.6 per cent is found by including those who died during the hospitalization in which the wound rupture occurred. It appears to us that the surgical deaths were due as much to the weakening effects of the underlying causes of the wound rupture as to the lethal effect of the disruption itself. The patients who died presented the picture of surgical exhaustion one sees in patients with the same conditions who succumb without evisceration. Follow-up on the patients with carcinoma shows that several died after leaving the hospital but their deaths could not be attributed to the disruption of their wounds.

In Maes' series there was a mortality rate of 28 per cent; Grace, 41 per cent; Colp, 41 per cent; White, 53 per cent; Meleney and Howes, 44 per cent; Wallace, 28 per cent and St. Francis Hospital, 20 per cent.

Any review of a problem such as this naturally evokes a question as to what can be done by the surgeon to prevent this unhappy event or how to treat it once it is an established fact. We believe that prophylaxis lies not at the time of closure but rather in the postoperative period. Vigilance during this time is the prime requisite and this can best be translated into action by careful attention to a good, full respiratory exchange, adequate gastric

suction and decompression of the bowel, extreme care with urinary problems, etc. It is our belief that it is not sufficient to be mindful of these difficulties but that one must check them frequently and furthermore take decisive action if there is the slightest evidence that the patient is headed for a storm. This is particularly true in the use of gastric suction when the tendency of many men seems to be to wait a little while to see if the patient will get by. We believe there is little risk in a properly passed tube early in the postoperative period whereas such a procedure from the fifth day on may produce enough resistant activity and distress in a sick patient to finish the disruption begun long before the tube is exhibited.

It is not our purpose to discuss the subject of early ambulation in this paper but one author has cited early ambulation as a cause of wound disruption. It has been our observation in a series of patients who got out of bed between five and twenty-four hours after major abdominal procedures that their respiratory exchange was remarkably improved and gastrointestinal complications were at a minimum. In these patients who number well over 150 and include many upper abdominal wounds only one wound problem was encountered. This patient had a fairly widespread metastatic process in both lower lung fields and there was absolutely no way to control a racking cough which became progressively worse and finally necessitated revision of the wound before he died of carcinoma.

Definitive care of the established problem has long been recognized as resuturing with material heavy enough to hold against the straining abdominal wall. Taking a leaf from the book of the man who resutured the wet wound on the fourth day we advocate resuturing these dripping wounds before the patient is forced through the shocking and depressing effects of a sudden blowout.

In summary our view of the patient who had a ruptured wound would show that he was one who entered St. Francis Hospital for a major abdominal procedure, had a physical status that made him either a good, fair or poor surgical risk and this physical evaluation included the possibilities that he might have physicochemical deficiencies and underlying secondary diseases. He submitted to a surgical procedure under spinal or inhalation anesthesia and had a routine wound closure with absorbable sutures. Up to this point he does not differ from the other 12,725 patients in this series. The chances are that he has an upper abdominal surgical problem but his wound did not disrupt because he was done by any particular surgeon. His postoperative course has been much more difficult than that of his friends and this has been featured by either a severe, continuous cough, vomiting, abdominal distention, urinary difficulties or any combination of these. He also has had a much longer period of morbidity and the temperature chart has averaged much higher than that of the other patients. The chances are even that he has saturated his first and subsequent dressings; and when the skin sutures have been removed, instead of being ready to go home he has been on the brink of returning to the operating room for a secondary closure. From this second trip the chances are four out of five that he will finally get to go home with a wound as good as new but achieved at a much greater cost in money and physical and mental resources.

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# STATISTICAL ANALYSIS OF 1,637 CASES OF CERVICAL CARCINOMA*

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THE study of carcinoma of the cervix uteri is hampered by both insufficiency and inexactness of statistical material. The former defect would in large measure be remedied if cancer were made a reportable disease. The adoption of reliable criteria for the appraisal of available data is a more difficult task requiring a departure from accepted concepts and a revision of established habits of thought.

In this series of 1,637 patients with cancer of the cervix all stages of the lesion are represented. All are verified cases of patients admitted to the New York City Cancer Institute and Clinic from 1923 to 1946 inclusive. Analysis of this series will underscore the careful research being done in this field. It will also disclose some of the flaws in current statistical methods which I believe must be overcome if we are to have a better understanding of the nature and treatment of the disease.

*Age.* Breakdown of incidence according to age offers no difficulty. As Ewing[1] and many others observed, cancer of the cervix chiefly affects women in the fifth decade of life.

Two patients of twenty years and one of ninety-four represented the age extremes in our study. (Table I.) These figures correspond fairly closely to those in other large series. Scheffey, Thudium and Farell's[2] case of an infant twenty-two months old was exceptional.

Almost half our patients (49.4 per cent) fell into the age bracket between forty and fifty-five, with the five-year period between forty-five and fifty that of peak incidence. (Table II.) Healy[3] also encountered the peak in that half decade.

*Race.* The proportion of colored to white patients in our series (31.3 per cent to 68.3 per cent) was somewhat higher than the racial ratio for the population of the city as a whole. This appears to confirm the belief that the disease is more prevalent among colored people than white people; according to the U. S. Public Health Service,[9] it is 63 per cent more so. At the Charity Hospital in New Orleans[5] where the ratio of white to colored patients in general is 55:45, 500 consecutive cases of carcinoma of the cervix uteri occurred in 317 Negroes and 183 whites.

At the Memorial Hospital, on the other hand, Smith[10] found the percentage of colored patients with cancer of the cervix to be distinctly less than their numerical

TABLE I
AGE INCIDENCE IN 1,637 CASES OF CERVICAL CANCER

| Age (Yr.) | Cases | |
|---|---|---|
| | No. | Per cent |
| 20 to 25 | 12 | 0.7 |
| 25 to 30 | 31 | 1.9 |
| 30 to 35 | 111 | 6.8 |
| 35 to 40 | 204 | 12.5 |
| 40 to 45 | 260 | 15.9 |
| 45 to 50 | 299 | 18.2 |
| 50 to 55 | 250 | 15.3 |
| 55 to 60 | 177 | 10.8 |
| 60 to 65 | 130 | 8.0 |
| 65 to 70 | 83 | 5.1 |
| 70 to 75 | 48 | 2.9 |
| 75 to 80 | 18 | 1.1 |
| 80 to 85 | 10 | 0.6 |
| 85 to 90 | 2 | 0.1 |
| 90 to 95 | 2 | 0.1 |
| Total | 1,637 | 100.0 |

* From the New York City Cancer Institute, N.Y.

ratio in the city's population. In a group of 226 patients personally interviewed by him there were only 8.8 per cent Negroes, compared to 15.3 per cent in a non-cancerous control group. A series of 3,106 cases assembled from the hospital's files revealed an even smaller proportion (7.2 per cent). Undoubtedly, these figures represent the experience of a particular institution rather than the true incidence of the disease in the colored race.

TABLE II
AGE OF PEAK INCIDENCE IN CERVICAL CARCINOMA

| Observer | Total Cases | Peak Age (Yr.) | Cases | |
|---|---|---|---|---|
| | | | No. | Per cent |
| Di Palma, S. | 1,637 | 40 to 50 | 559 | 34.1 |
| Waterman, G. W. and Di Leone, R.[4] | 507 | 46 to 55 | 159 | 31.4 |
| Graffagnino, P. and McFetridge, E.[5] | 500 | 36 to 45 | 175 | 35.0 |
| Schriener, B. F. and Kress, L. C.[6] | 417 | 40 to 49 | 130 | 31.2 |
| Ward, G. G.[7] | 357 | 40 to 49 | 121 | 31.1 |
| Johnston, J. R. | 233 | 40 to 49 | 66 | 28.3 |
| Scheffey, L. C., Thudium, W. J. and Farell, D. M.[2] | 293 | 40 to 49 | 87 | 29.7 |

*Jewish Immunity.* The number of Jewish patients in our series (fifty-five or 3.3 per cent), though small, was somewhat higher than observations on the infrequency of the disease among Hebrews might lead one to expect. Hoffman[11] cited reports of studies in Amsterdam, Budapest and Munich and the consensus was that carcinoma of the cervix is uncommon among Jews, occurring only a third or a fourth as often as among Christians. Horwitz[12] reported only ten Jewish patients among 1,237 cases at the Mayo Clinic. At the Memorial Hospital, however, the Hebrew incidence rate (4.2 per cent) slightly exceeded ours. It may be that the large Jewish population of New York, with its tendency to seek specialized medical care, accounts for the higher incidence here.

*Marital Status.* The high incidence of cervical carcinoma among married women (96.7 per cent) would appear to make marriage a major threat on this score. However, since the great majority of women within the period of susceptibility are married, it cannot be assumed that marriage *per se* is the inciting element.

There can be no doubt, however, of the fact that child-bearing increases the danger of cancer of the cervix. In our series the incidence was 84.5 per cent among women who had borne children compared with 9.4 per cent among nulliparae. In Schriener and Kress' study 88.2 per cent were mothers. Graffagnino and McFetridge, and Scheffey, Thudium and Farell reported an even higher proportion of parous victims (91.4 and 91.5 per cent, respectively), and their figures were surpassed by Healy's (95.0 to 96.0 per cent).

### PATHOLOGIC CLASSIFICATION

Pathologic classification, like incidence, affords no problem. Of 1,436 cases, 1,390 (96.8 per cent) revealed squamous epidermoid carcinoma while adenocarcinoma was present in only forty-six (3.2 per cent). This overwhelming preponderance of the epidermoid form was also observed by Willmott Dobbie, (96.8 per cent)[13] and Waterman and Di Leone (97.3 per cent). Johnston, and Teahan and Wammock[14] reported somewhat lower ratios (80.2 and 76.5 per cent, respectively).

According to Ewing's dictum neoplasms of the vaginal portion of the cervix are almost exclusively epidermoid. In the cervical canal the epidermoid and glandular types meet and intermingle.

*Coexistence of Syphilis.* Results of Wassermann tests were available in 1,326 patients. The positive reaction in 11 per cent was not materially higher than in general hospital admissions. Syphilis was present in 12.9 per cent of Schreiner and Kress' patients.

*Causes of Death.* The number of deaths in our series was 1,367 or 83.5 per cent of the total of 1,637 cases. A breakdown of

the causes, as revealed by 124 autopsies,[15] is illuminating. (Table III.) Sepsis, for example, was the most important single factor; its various manifestations acted as the precipitating incident in 74.2 per cent of the cases studied at necropsy. Hemorrhage, on the other hand, was responsible in only 8.1 per cent. Uremia and pneumonia claimed 4.8 per cent each. Undoubtedly, the number of fatalities from sepsis would be less today, with the effective therapeutic agents now at our command.

TABLE III
CAUSES OF DEATH IN CANCER OF THE CERVIX POST-MORTEM FINDINGS

| Lethal Factor | Cases | Per cent |
|---|---|---|
| Sepsis | | |
| Local, vaginal, pelvic ulceration. Abscesses, parametritis, fistulas, etc. | 17 | 13.7 |
| Peritonitis | 18 | 14.5 |
| General (including endocarditis and bloodstream infection) | 28 | 22.6 |
| Nephrogenic | 29 | 23.4 |
| Total, sepsis | 92 | 74.2 |
| Hemorrhage | 10 | 8.0 |
| Uremia | 6 | 4.8 |
| Pneumonia | 6 | 4.8 |
| General metastases | 5 | 4.0 |
| Cardiac failure and pulmonary edema | 3 | 2.4 |
| Intestinal lues | 1 | 0.9 |
| Embolism | 1 | 0.9 |
| Total | 124 | 100.0 |

### CLASSIFICATION OF THE DISEASE

It is when we approach classification of the various stages of cervical cancer that current methods appear to confuse rather than clarify. The divisions adopted by the League of Nations and others, commonly accepted as a measure of the degree of advancement of the lesion, frequently fail to match the significance of the clinical picture.

Carcinoma of the cervix uteri starts as a very small lesion localized, in its preinvasive stage, in the epithelial layer. It has two methods of extension, namely, (1) usually by centripetal growth toward the cervical myometrium and (2) occasionally by centrifugal expansion manifested in a polypoid or cauliflower-like mass projecting from the cervix into the vaginal canal.

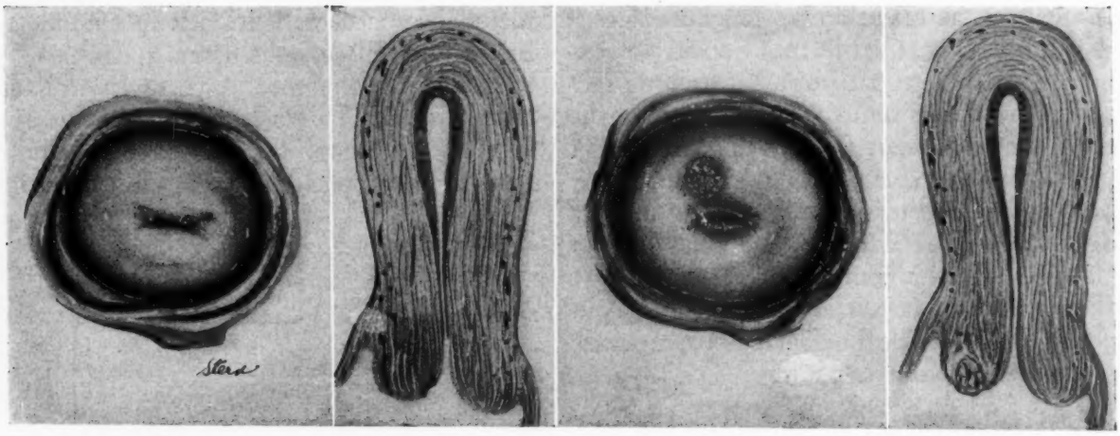
As a rule the centripetal lesion spreads by direct infiltration of the surrounding tissues, producing a pronounced inflammatory reaction at its periphery and is, in my opinion, usually a very slow-growing process. Widely scattered metastases are not the rule. When secondary tumors occur, they are more often produced by embolism than by direct permeation of the lymphatic channels.

In the centrifugal type of expansion there is not usually extensive cervical invasion in the early stages, even though the neoplastic mass may be large. Because of its circumscription and early symptoms this type of tumor is more amenable to treatment than the centripetally directed growth.

If the neoplasm is composed of an embryonal type of cell, its advance tends to be rapid. These cells usually spread by invasion of the perivascular lymphatic channels, blood vessels, fascial spaces and lymphatic glands. A more mature cellular type usually presages slower growth. Some tumors exhibit both types of cells but one or the other usually predominates.

The League of Nations' classification fails to take these factors into account. While its descriptions of Stages III and IV are acceptable, the conditions it lays down for I and II often run counter to clinical experience.

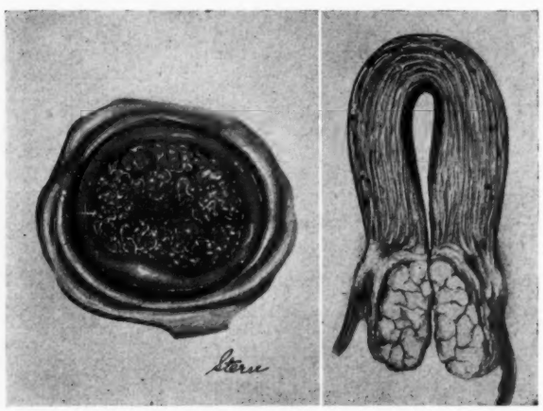
For Stage I, for example, it prescribes that the uterus must be mobile, with the growth strictly limited to the cervix. This permits the inclusion of long-standing neoplasms which have had an opportunity to invade glands. It may explain the high incidence of glandular involvement found at operation upon so-called Stage I patients. From the clinical viewpoint it is illogical to include the first phase the minute preinvasive lesion (Fig. 1), the early lesions (Fig. 2) and the centripetally directed



1A 1B 2A 2B

FIG. 1. A, anterior view; preinvasive cervical growth; classified Stage I, League of Nations; B, sectional view; preinvasive cervical growth; classified Stage I, League of Nations.

FIG. 2. A, anterior view; early cervical lesion; classified as Stage I, League of Nations; B, sectional view; early cervical lesion; classified as Stage I, League of Nations.



3A 3B

FIG. 3. A, anterior view; centripetally advanced cervical growth confined to cervix; classified as Stage I, League of Nations; B, sectional view; centripetally advanced cervical growth confined to cervix to be classified Stage I, League of Nations.

tumors of many years' standing involving virtually the entire cervix. (Fig. 3.)

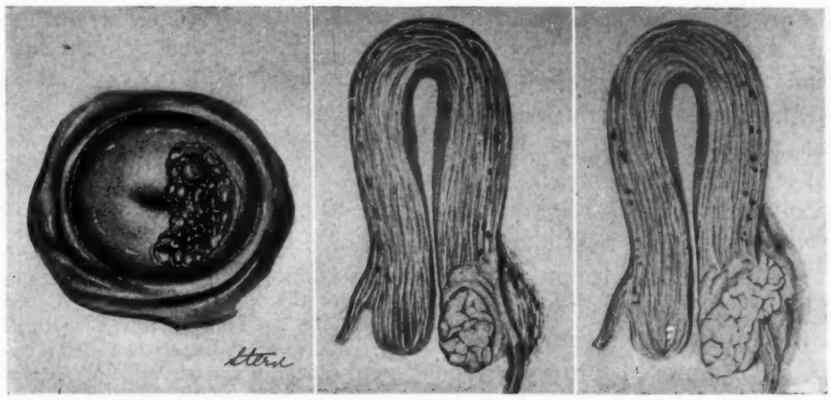
Stage II affords comparable objections. According to the official description the "lesion is spread into one or more fornices with or without infiltration of the parametrium adjacent to the uterus, the uterus retaining some degree of mobility." Without microscopic eyes, however, who can say whether the fornical thickening is neoplastic or inflammatory? In several of our patients apparently carcinomatous involvement of a small portion of the upper vagina proved to be inflammatory; the reverse could just as easily be true. A moderately early lesion as shown in Figure 4 would have to be designated as Stage II according to the League of Nations' classification.

Miller,[16] and Graffagnino and McFetridge commented on the impracticability of the League of Nations' categories which fail to take into account the difficulty of determining parametrial extension. A taxonomic method which corresponded more closely to pathologic and clinical realities would help to standardize statistical data and provide a sounder basis for choice of treatment and prognosis.

## TECHNIC

The choice of therapeutic method must necessarily be determined by the conditions presented in the individual case and the expectations engendered by experience. Unfortunately, there does not appear to be a standardized criterion of success in this respect. Such terms as five-year cures, five-year survival and five-year salvage all appear in the literature; however, the figures are rarely accompanied with description of the local condition. Absence of symptoms for five years is concededly no evidence of a "cure" since recurrences may take place after an even longer symptom-free period.

However, taking survival for five years



4A 4B 4C

FIG. 4. A, anterior view; moderately early cervical lesion with inflammatory fornical involvement to be classified as Stage II, League of Nations; in reality only Stage I; B, sectional view; moderately early cervical lesion with inflammatory fornical involvement to be classified as Stage II, League of Nations; in reality only Stage I; C, sectional view; moderately early cervical lesion with actual fornical involvement; a true Stage II, League of Nations.

without apparent symptoms, recurrence and metastases as a gauge of successful therapy, on the basis of all cases of carcinoma of the cervix, there can be no doubt that irradiation is the method of choice.[17–19] From the over-all viewpoint it is safer, more effective and produces fewer immediate deaths resulting in a greater number of patients who survive for five years or more. In 1939 the League of Nations' report[20] credited radiotherapy with an average five-year survival rate of 27.6 per cent for all stages of cervical carcinoma. What surgeon can match this on the basis of unselected cases?

It is true that the careful selection of cases is a *sine qua non* of successful operative intervention in this disease. Practically all surgeons[21–23] agree that the lesion must not have passed the second stage, at latest, and that the patient must be a first-class risk from the viewpoint of age, weight, general health, etc. In these favorable conditions Lynch declared that surgery yields a higher percentage of ten- and even fifteen-year cures than irradiation therapy. Combining sixteen reports from fifteen different clinics—a total of 3,239 patients upon whom the Wertheim operation was performed—he arrived at the figure of 40.5 per cent five-year survivals.

On the basis of accepted surgical indications it may be assumed that those 3,239 patients were in the first and second stages. According to the League of Nations' figures in the official report published in 1937,[24] however, five-year survival following irradiation was of the order of 75 per cent for Stage I and 50 per cent for Stage II. In some clinics the figure for Stage I was as high as 83.3 per cent; for Stage II it was 65.6 per cent. On the grounds of immediate mortality, also, the odds favor irradiation[25] even though chemotherapy, blood plasma and the intravenous administration of proteins have sharply reduced the number of surgical deaths.

Finally, it must be admitted that the Wertheim and related operations require an exceptional degree of skill and experience. The results obtained by a handful of outstanding surgeons will not be matched by otherwise competent men with fewer opportunities to perfect this specific technic.

## EARLY DIAGNOSIS

All too many cases of cervical carcinoma are first seen in a period of development in which the possibility of cure is dubious if not hopeless. In 1933 the League of Nations' five-year survival rate for Stage III was 26.4 per cent which dropped to 5.3 per cent for Stage IV. Even in the sample clinics with the best results there was a

wide discrepancy between the mortality in the early and late phases, viz., 13.3 per cent for Stage I, 42.4 per cent, Stage II, 54.0 per cent, Stage III and 78.6 per cent, Stage IV. Need more be said of the urgency of early diagnosis?

Unfortunately, the preinvasive and very early stages which offer the best chance of genuine eradication of the lesion do not often make their presence known to the examiner's eye. In the great majority of cases it can be diagnosed only by the Papanicolau vaginal smear. Periodic application of this procedure to women in the susceptible age period offers the best hope of discovery of cervical carcinoma in a really curable stage. However, more gynecologic pathologists and technicians must be trained in the expert performance of this valuable test before it can be generally employed.

## SUMMARY AND CONCLUSIONS

1. In this series of 1,637 cases of cancer of the cervix uteri almost half the patients were between forty and fifty-five years of age, with the peak incidence between forty-five and fifty. The overwhelming majority (84.5 per cent) had borne children.

2. The low incidence among Jews and high incidence among Negroes was confirmed.

3. In 124 cases studied at autopsy sepsis was the most frequent cause of death (74.2 per cent). Hemorrhage was the precipitating factor in only 8.1 per cent.

4. The League of Nations' classification of the stages of cervical carcinoma does not correspond to clinical realities, especially in its description of the first two stages, and should be revised.

5. In the great majority of cases irradiation therapy is the method of choice, resulting in fewer immediate deaths and more five-year survivals.

6. The Papanicolau vaginal smear affords the best hope of early diagnosis when the changes of cure are optimal.

7. It is recommended that cancer be made a reportable disease.

*Acknowledgment:* The author wishes to thank Dr. Maxwell Schram for his valuable help in assembling the case data.

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The cause of intussusception in children is not yet clear; mechanical causes such as polyps and diverticuli were found to be an etiologic factor in only 5 per cent in a series of over 600 cases studied. Diagnosis can readily be made in 90 per cent of all patients, based on sudden abdominal pain, presence of an abdominal mass and passage of bloody mucus from the rectum. In doubtful cases a barium enema will usually confirm the diagnosis since the colon is almost invariably involved, especially as the receiving segment of the intussusception. After rapid preparation for surgery (fluids, transfusions, antibiotics) a right rectus incision is usually made and the intussusception is reduced by taxis (it is dangerous to use traction). If the bowel is gangrenous, resection of the involved area is required. Often the shock is less, as is also the mortality, when a Mikulicz aseptic resection is done. Primary end-to-end or end-to-side anastomosis may be a superior operation but the operative mortality may be greater. The surgeon will have to use his best judgment in each particular case. Postoperatively, gastric suction and adequate fluid administration are essential to a favorable convalescence. (*Richard A. Leonardo, M.D.*)

# TRANSABDOMINAL SPLANCHNIC ANESTHESIA FOR GASTRIC SURGERY

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IN spite of the fact that splanchnic anesthesia has been used in European clinics for many years it has never attained popular usage in the United States.

Kappis, in a report to the Surgical Congress in Berlin, 1914, paved the way with his experimental work in animals and in 1918 reported on the use of splanchnic anesthesia in 200 cases in man. Kappis' approach was posterior at the lower border of the twelfth rib and 7 cm. from the spinous process. The needle was introduced at an angle of 30 degrees. Injection of anesthetic solution was made as soon as the point of the needle reached the union of the lateral and anterior surface of the body of the vertebra. He also made other injections up and down the side of the vertebral column.

Braun opened the abdomen, retracted the left lobe of the liver upward, depressed the stomach downward and to the left, palpated the aorta above the pancreas through the gastrohepatic omentum, separated the aorta and vena cava digitally and injected into the retroperitoneal spare around the celiac plexus.

Meeker in 1925 reported on forty-two cases of splanchnic anesthesia at the Mayo Clinic with general conclusions that it was unsafe and unsatisfactory anesthesia.

Hans Finsterer of Vienna, Ogilvie of London, Labat of New York and de Takats and Phil Thorek of Chicago have done much to stimulate interest in splanchic anesthesia and demonstrate its safety and effectiveness.

Few large medical centers in the United States utilize splanchnic anesthesia and the reasons are quite obvious I believe. The posterior approach of Kappis is a blind procedure and except in highly skilled hands leads to too many failures. It is not without the hazard of intravenous or intrathecal injections. The anterior approach of Braun requires a satisfactory abdominal wall block and the surgeon is faced with the additional responsibility of giving splanchnic injection to say nothing of the extra time involved. Fifteen or twenty minutes additional time look large to the surgeon with a big list. Also, in the larger medical centers skilled anesthesiologists relieve the surgeon of the worry about anesthesia and have lowered the morbidity and mortality as a direct result of anesthesia. Highly skilled experienced surgeons work with trained operating assistants; this tends to speed up total elapsed time for a given operation which also contributes to lowered mortality.

Most young surgeons completing their training in the United States today have little or no firsthand knowledge of splanchnic anesthesia. Many of them are gravitating to smaller cities and towns in which the safety factors present in the large centers are lacking and they cannot make up for their lack regardless of technical ability and judgment. The writer is convinced that a thorough mastery of splanchnic anesthesia will lower surgical mortality in the hands of surgeons working in small hospitals and believes that its adoption in suitable cases in the larger centers will lower still further their present low mortality.

In 1939 an elderly woman was brought to the operating room for surgical treatment of an obstruction lesion low in the pylorus. She had considerable retention and had been prepared for surgery in the accepted manner. General anesthesia was contemplated. The nurse anesthetist noti-

fied us prior to induction of anesthesia that her color was ashen gray, her pulse poor quality but regular and her blood pressure was under 100 systolic. Under these conditions we performed abdominal wall block, opened the abdomen and found an almost completely obstructing annular lesion proximal to the pyloric ring with no palpable glands and no metastasis to the liver. This was obviously ideal for resection. However, the patient was wide awake and in very poor condition. We performed anterior splanchnic injection using a spinal needle. A gastric resection and posterior Polya anastomosis was performed with no discomfort to the patient. She left the operating room with a better color, pulse and blood pressure than when she entered. Operating conditions were excellent and no supplementary anesthesia was necessary for closure. Her postoperative course was uneventful except for some gastric retention for a short period. She left the hospital thirty days later, remained in good health for two years and died two and a half years postoperatively with gradually increasing painless jaundice. Permission for autopsy was refused.

Since 1939 abdominal wall block and anterior splanchnic anesthesia have been used in varying age groups, in carcinoma, in ulcer, for gastric resection and for gastroenterostomy. We have had no experience with its use in biliary surgery. The types of incision have varied but the anesthesia technic has remained the same.

It is important that fairly heavy preoperative sedation be secured. Abdominal wall block is done raising a wheal at the tip of the ensiform and three or four wheals at the lateral edge of each rectus muscle to a level of 2 inches below the umbilicus. A longer needle is next used and by a sense of touch the needle is made to perforate the anterior sheath. This is readily felt and 10 to 15 cc. of ½ per cent procaine are injected in each area. The subcostal area is infiltrated from the wheal at the ensiform. No local infiltration is used in the line of incision anteriorly. The posterior sheath and peritoneum are infiltrated in line with the incision after exposure. On opening the abdomen the parietal peritoneum four fingerbreadths lateral to the incision is infiltrated with 5 cc. procaine in four or five areas on each side. The lesser curve of the stomach is depressed downward and to the left with the left hand while the assistant gently elevates the liver. The superior border of the pancreas is palpated and then the pulsation of the abdominal aorta. The space between the aorta and vena cava is widened somewhat by the left index and middle finger. A long No. 20 or No. 22 short bevel spinal needle is then introduced over the dorsum of the index finger and thrust through the gastrohepatic omentum until the needle point strikes bone. The point is next withdrawn slightly making sure it remains retroperitoneal. Aspiration is attempted; and if no blood returns, 70 cc. of ½ per cent procaine are injected. We use a 20 cc. syringe and aspirate before each injection keeping the needle in place constantly. Aspiration of blood is an indication to abandon the procedure. It has not occurred in our cases. The next injection of 5 cc. ½ per cent procaine is made at the cardia and just above and below the pylorus in the omentum. The operation can now proceed.

## CONCLUSIONS

1. Anterior splanchic anesthesia has been used with the paramedian, upper midline and Sloan incisions.

2. Adequate sedation is essential.

3. The older and more debilitated the patient the more satisfactory the procedure. Heavy muscled obese and young individuals do not lend themselves so well as the older age groups.

4. Previous operative procedures and extensive inflammatory reaction in the upper abdomen militate against success.

5. If the operation exceeds two and a half hours' duration, it will frequently be necessary to re-infiltrate the abdominal wall or use a short supplementary anesthetic to close the abdomen without tension.

6. Lack of shock, good color and sense of well being in a conscious patient who can be made ambulatory the day of or the day following an extensive surgical ordeal are rewards enough and justify the small additional time and nervous strain on the surgeon. Satisfactory induction of this anesthesia requires no special apparatus or needles other than the equipment usually found in the small hospital.

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Statistics show that a tendency toward cancer of the breast is often inherited frequently by various members of the same family and involving the same breast. The left breast is apt to harbor cancer more often than the right one and statistics indicate that injury to the breasts is a frequent predisposing factor; also, the left breast is more often injured than is the right one. After onset of the menopause the incidence of cancer of the breast markedly diminishes, a fact that makes one suspect that the presence of active estrogenic hormone is a related etiologic condition. (*Richard A. Leonardo, M.D.*)

# TECHNIC OF HOLLOW VISCERAL ANASTOMOSIS

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THE term visceral as employed here in visceral anastomosis is used to signify a method of anastomosis of one hollow viscus to another be it gastro-enterostomy, duodenogastrostomy or enterostomy, entero-enterostomy or esophago-enterostomy. The principles considered in any method of adequate anastomosis are the following: (1) to approximate the layers to each other in order to secure an adequate union or strong suture line; (2) to prevent contamination of the peritoneal cavity by leakage or spillage of visceral contents, i.e., to perform an aseptic technic; (3) to prevent hemorrhage of the suture line by adequate ligature and repair; this may be considered an additional corollary of both of the aforementioned; (4) to prevent gangrene or necrosis of the sutured ends which results in leakage such as may occur with clamp methods of anastomosis; (5) to prevent obstruction of the formed stoma or prevent a poorly functioning stoma and (6) to prevent postoperative adhesions.

It follows that by observation of the aforementioned principles the complications of hollow visceral anastomosis will be prevented. To those principles which resolve into safety must be added the factors of simplicity of technic and speed necessary for the successful performance of any operative procedure.

Saltzstein and Podolsky[5] during the course of intestinal anastomosis in animal experimentation found the chief causes of unsuccessful suturing were inadequate blood supply, tying sutures too tightly and causing local tissue strangulation, not approximating the anastomosis carefully and gross soiling of the peritoneal cavity with intestinal contents.

They found that the most important principle in successful anastomosis is the adequacy of the blood supply. In lateral anastomoses the arterial blood supply is adequate but in end-to-end anastomoses necrosis of the distal end is apt to occur especially on the antimesenteric border. Many instances of softening occurred here with leakage which on analysis was found to result from infolding the bowel too tightly or isolating the mesenteric border too far from its blood supply.

Tying knots too tightly produced edema, local tissue necrosis, a break in the serosa and infection with now no natural protection from the local serosal area involved. The tacking stitch placed in the angle or corner of the anastomosis for extra assurance was found to be responsible for fatal peritonitis in many instances. It has been said that more deaths occur from leakage of the suture that does not catch the submucosa than from sepsis that may follow penetration of the mucosa since the latter stitch is usually looser and under less tension. The principle from this is that the inner layer of sutures must be snug enough to produce hemostasis and the serosal layer must be approximating, which is more important than the type of suture or the number of layers of suture used.

Saltzstein and Podolsky[5] report they have never had a leakage on the posterior layer. All occurred on the anterior layer and in 60 per cent of the cases at the angle, the potential weak spot. Angle leaks were not prevented by adding more sutures which infold more bowel. They were eliminated by a smooth, well approximated suture line which turns in the mucosa neatly and approximates the serosa with its fellow without ruffles or excess tissue by adjusting the lengths of bowel to be approximated. Basting stitches at the ends are then superfluous and even dangerous.

It may be interesting to note that Totten[14] has found that an accurately placed, one-layer anastomosis using the continuous right angle suture with reinforcements of interrupted mattress sutures at each end is adequate. An additional layer of sutures disrupts the continuity of mucosal apposition accomplished by the first layer and prolongs healing.

Tacking omentum over a poor suture line will not prevent leaks. Again the application of Allis clamps, ring forceps or other instruments to hold the bowel produces a sandboil appearing as a dull, reddish blister which is a subserosal hemorrhage. This has resulted in a fatal perforation. Mucosal hemorrhages from use of these instruments also occur.

Jobert and Lembert[7] showed that good union will follow if the serous surfaces of the loops are brought together. Later experiments have shown that better union of two parts will follow in which corresponding layers are sutured together as serosa to serosa, muscularis to muscularis and mucosa to mucosa, the true three-layer method of anastomosis. The true strength of the union is given by the submucous layer (Halsted), i.e., the muscularis, and the real holding layer which gives firm strength to the suture line is the anastomosis of the muscularis and mucosa of each side,[7] the two-layer method of anastomosis in which the second layer is the serosal or serosal-muscularis anastomosis. This method of suturing the mucosa and muscularis in one layer prevents pocketing between mucosa and muscularis, approximates the mucosa preventing leakage of contents, everts the mucosa thereby keeping the stoma patent by preventing stomal cross adhesions and prevents hemorrhage by snugly encircling bleeders with the continuous suture. Therefore, it is advisable to include the mucosa with the muscularis when suturing that layer, the modified three-layer method. This is the method of our choice.

As a corollary to prove the muscularis is the true holding layer of anastomosis, a really strong union is secured not only by suturing through the entire thickness of the wall of the viscus (single layer anastomosis) but also when the bite includes the entire wall with the exception of the mucosa. The serosa serves only as the plastic material which prevents leakage of the gastric or intestinal contents into the peritoneal cavity.[7] The weakest point in the anastomosis is at the mesenteric attachment.[5,9,13]

That leakage is a very important and frequent occurrence in anastomosis is emphasized be DeVine[2] who noted in the postmortem department and in instances in which experimental sutures had been put into redundant exteriorized colon that each particular suture hole became infected and, therefore, a potential source of sepsis or leakage. Collins[1] has pointed out that occasionally a Lembert type of suture enters the intestinal lumen and is thus contaminated. DeVine[2] believes this is the reason for the adoption of Paul-Mikulicz procedures followed by non-suture anastomosis with a crushing clamp, aseptic anastomosis technics and other methods. The most important sutures accordingly are those that bring peritoneum to peritoneum for in some methods of aseptic anastomosis no attempt is made at mucosal apposition by suture. To prevent leaks, therefore, the vulcanizing on of peritoneal grafts or split skin grafts over the suture line is recommended, supplemental to the usual methods of anastomosis. This method embraces the stitching on technic simplified by Young and Favata[14] who used thrombin solution on the graft and pooled plasma on the recipient area to produce fibrin fixation and cause the graft to adhere to the donor site without sutures.

The type of suture material in successful anastomosis, namely, catgut, silk, cotton, linen or wire has perhaps been overemphasized by various devotees but not without justification. Certain basic principles of suture material and type of suturing in intestinal work have emerged. All authorities agree the finest suture mate-

rial compatible with strength should be used. Thick catgut is too heavy for the thin intestinal walls and fine catgut is too rapidly absorbed. These with the exception of fine catgut for mucosal suturing have lost ground. Hoag et al.[3] conducted an experimental investigation into the properties of stomal obstruction and marginal ulcer in gastrointestinal anastomosis with study of the factors producing undue thickness, rigidity and fibrosis of the anastomotic ring. Observation on animals impressed the authors with the great variation of a structural and functional character found at the anastomosis. It became apparent that with all other factors of surgical technic equal the variable responsible for such differences was the type of suture material employed and the position occupied by this material. In animals in which both serosal and mucosal layers were done with continuous silk a segment of silk was invariably found extruded in the lumen of the gut. Under these conditions the stomal ring was always two to three times thicker than in those animals in which silk was not used, or if used had not become exposed to the lumen. This thickening was the result of edema and fibrosis following infection. Further, it was noted that as long as the silk remained within the tissue and was partly exposed, the thickness persisted regardless of the number of days which had elapsed since operation. In some cases the stoma was so thick the opening had little possibility of change either in size or shape with peristalsis. Experiments with silk in combination with other materials produced the following conclusions, namely, where continuous silk was used in both inner and outer layers, the thickening of the stomal ring was maximal and the orifice was rigid and unyielding due to a diffuse fibrous reaction set up in all the intestinal layers along the infected pathway of the migrating silk sutures. Some silk was invariably exposed, festooned in the lumen with small ulcers in the mucosa and the inflammatory process extended over the entire stomal course until the whole suture had sloughed out. When a continuous silk outer layer and continuous fine-chromicized catgut inner layer was used, the thickness was not excessive provided the silk of the serosal layers did not become exposed within the lumen of the gut. In this case edema and fibrosis occurred as in the previous experiment. When an interrupted silk outer layer and a continuous catgut inner layer was used, there was seldom any increased stomal thickness even though one or more of the individual silk sutures became exposed in the gut lumen. Any inflammatory reaction that occurred was confined to the course of the suture itself. Such a suture when exposed was rapidly cast off into the gut lumen. When interrupted silk sutures were used in both inner and outer layers, a satisfactory stomal ring was produced but thicker than that in the aforementioned experiment due to the variation in time it took to cast off the interrupted silk mucosal sutures. When interrupted catgut or continuous catgut was used for both layers, the healing was satisfactory and the stoma the same as when interrupted silk outer and continuous catgut inner layer was used. There were no stomal ulcers or impaired circulation. There was an impression, however, that it took longer for union of these anastomoses to become firm and solid due to the inferior quality of fibrous tissue reaction, confirmed by histologic examination, when compared to the tissue reaction produced by interrupted, uninfected silk suture. Thorek[12] used two rows of suture in anastomosis, an inner absorbable (catgut) and an outer non-absorbable (silk). He considered this a safer precaution because catgut may be absorbed too early and give rise to trouble.

In our series we used tanned intestinal catgut on double straight needles throughout for all layers. Our method which will be described in detail is essentially a continuous running suture in layers beginning in the center and tied in the four quadrants of the suture line so that the field and especially the corners where accidents are prone

to occur are under constant vision. The usual method of anastomosis begins at one corner so that when the final sutures are inserted, perfect vision of the corners is lost and a true suture line may not be obtained. This results in weakness, eventual leakage, peritonitis and has been the cause of mortality in intestinal repair.

The method described is almost similar to that employed by Sinaiko[6] in his bowel anastomosis following obstructive resection. After dividing the spur between Payr clamps, he employs a through and through running lock stitch of catgut from the center, between guy sutures. At the lateral angle change is made to the Connell stitch and the completed suture meets its fellow from the opposite side on the proximal wall where it is tied. Pringle[4] describes a method in end-to-end anastomosis useful in war surgery. He cites the disadvantages of the usual method of end-to-end anastomosis which is to unite the anterior ends with two layers of suture, an inner all coat and an outer seromuscular, produces abscess leading to peritonitis and ileus due to the difficulty in closing the mesenteric angle and also produces a thick, rigid, anastomotic line predisposing to mechanical obstruction. His technic is to insert three double No. 0 catgut sutures from within outwards in the efferent gut, then insert the sutures 1 inch distal to the resection line in the afferent loop equidistant around the circumference of the gut and bring it back to the efferent loop from within and tie. This invaginates the afferent in the efferent loop. A continuous suture picking up all the coats of the efferent loop and the seromuscular coats of the afferent loop is inserted at the level of the mesenteric attachment. This is quick and easy, makes leakage impossible and offers less resistance to normal peristaltic movement but cannot control bleeding of the afferent loop and the sutures in and through the lumen of the gut may spread infection. Totten[13] described a method using a single layer continuous right angle suture of No. 40 cotton, with an interrupted mattress suture at each end. No leaks occurred with his method in forty patients.

Our method of suturing to be described obviates hemorrhage. Thorek[8] has shown that hemorrhage occurs from improper suturing. He recommends a continuous suture embracing all the coats of the viscus for best results applied so the mucosal edge is turned outward. The suture should be drawn through firmly without being too tight. Bacteria find a suitable media in sutured parts especially where there is stagnant blood.[10] Obstructive conditions after anastomosis when the stoma fails to function, are prevented by rolling the serosal layers out.

The method presented is not intended to replace the indications for the various clamp methods as in intestinal resections but it is a rapid open method of anastomosis which can be kept relatively aseptic although the aseptic technic is based on the principles of suturing the submucosal layers between viscera without entering the lumen of a hollow viscus, crushing the wall by using crushing clamps which also crushes the blood vessels and obviates hemorrhage and cutting the tissue with the cautery to render the field relatively aseptic. Usually patients requiring intestinal resection and anastomosis are in a somewhat relatively poorer condition.[11] For this reason Rankin, Wangensteen and Thorek[11] prefer the suture method or a closed method of anastomosis to the anastomotic devices. The use of clamps in any method may cause damage to the submucosa, thrombosis of the vessels, edema of tissues and cause or produce ulceration and later a weak suture line with subsequent perforation. Tight clamping of intestinal loops should therefore be avoided. Furthermore, the use of clamps may also damage the serosa and in addition to spillage, is also responsible for postoperative intestinal adhesions. Therefore, gentle handling of tissues is imperative.

Collins[1] has pointed out that certain accepted axioms in aseptic intestinal anas-

tomosis have been overemphasized, viz., that the inturned intestinal cuff is objectionable, that the internal row of sutures should be interrupted mattress sutures and that the crushing forceps when used should be quite narrow. In regard to the inturned intestinal cuff Halsted and his co-workers have shown that this soon disappears by slough and atrophy. After the anastomosis is completed, it may be wise to pass the tips of the thumb and forefinger through the anastomosis to test patency and perhaps free, agglutinated ends. He further notes that it is more important to have the suture line coapt the intestinal surfaces without tension than to be greatly concerned about a slightly larger inturned cuff. In regard to the use of interrupted sutures in the internal row such sutures have many knots to bury and invite subsequent trouble by strangulating the area they include, producing pressure necrosis and thereby affording a greater danger of leakage at this point. Again, interrupted sutures at this point in the presence of distention of the intestine become further separated and intestinal contents may escape whereas with a continuous suture the intestinal distention tends to tighten the suture line. We have thought this is a valid reason for using continuous sutures throughout. Another point Collins[1] emphasized is that suture material for the internal layer should preferably be absorbable, chromic, intestinal catgut mounted on a straight needle because non-absorbable suture material is cast off into the intestinal lumen;[11] and when it is partially extruded, it may adhere to the intestinal canal catching material and producing a possible degree of obstruction. Collins[1] also recommends the use of wide clamps to crush and yet hold firmly without cutting through or slipping off at a crucial moment. We present out method eliminating the use of clamps.

In the method to be outlined mucosa is always sutured to mucosa which perhaps is not of much importance in bowel-to-bowel anastomosis but is exceedingly important in stomach anastomosis since gastric ulcers as well as other complications can occur. Thorek[10] calls attention to the fact that an intestinal union by suture demands perfect technic and great care. The greatest value in results lies in a scrupulously exact suture after a correct adaptation of the opposed surfaces.[9] The chief danger after intestinal suture is peritoneal infection which may result from leakage due to faulty technic in suturing resulting in the opening of the suture line.[10]

### AUTHORS' TECHNIC

Our technic has gradually evolved to its present state from early work initiated by Dr. Joe K. Smith over the past twenty odd years. Our series consists of over 200 cases.

The parts to be anastomosed are manually approximated to each other after the usual calculation for site and length of stoma has been determined. These parts are gently immobilized by gloved hand or moist sponges held in the hand. A guy suture of catgut is then placed through both loops of viscera 1 to 2 cm. beyond the proposed stomal end and tied. (Fig. 1.) These act as anchor or tension sutures and after mosquito forceps are applied to give grasp or holding power, the exertion of slight traction tends to keep the opposed organs approximated. We have noted that the guy sutures should be placed on the medial-distal surface of the opposing viscera rather than on the proximal or proximolateral surface as seems to be the usual case. When traction is applied, the surfaces to be sutured tend to roll out; and when the anastomosis is completed, the stoma will maintain its patency. (Fig. 1.) Also, traction so maintained prevents purse-string action of the continuous suture. This is easily demonstrated by the fact that an unnatural pull develops when traction is applied to the stay sutures. When the stoma is formed by incising the walls of the opposing organs after the serosal layer has been sutured (which now becomes the posterior surface of the anastomosis), this wall falls away from the anterior wall by the application of the same

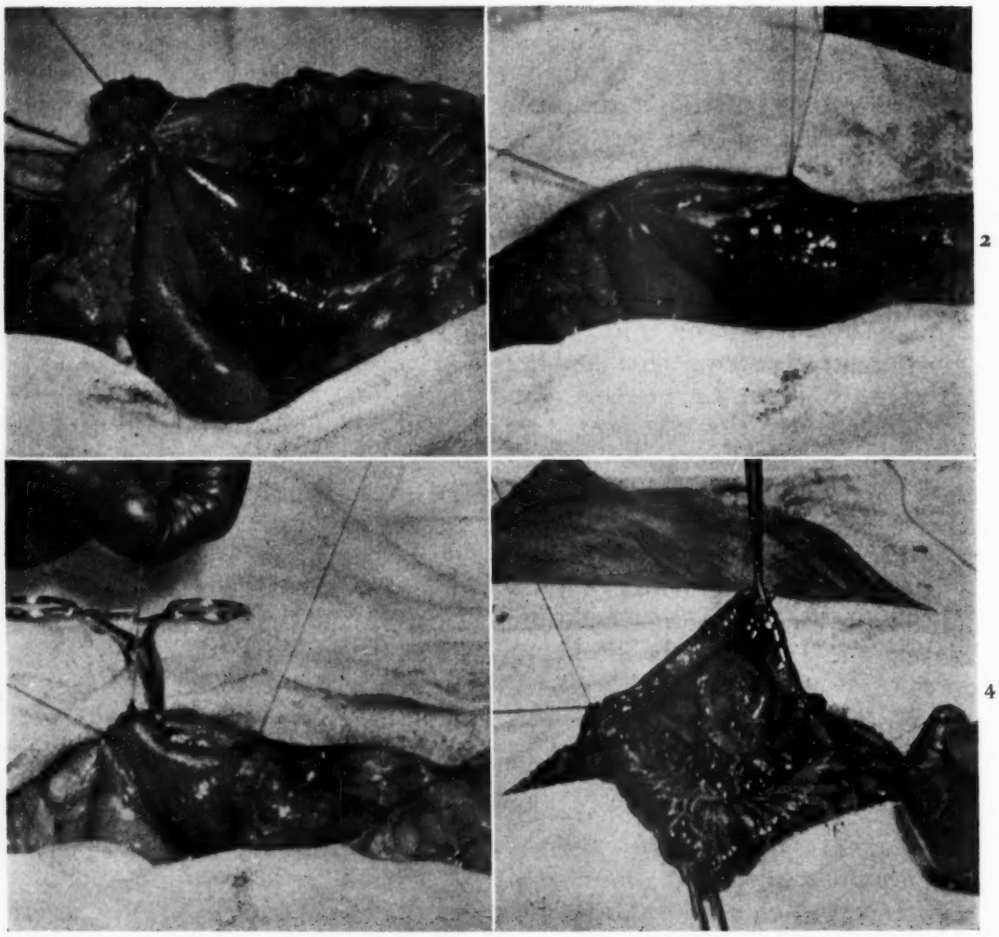



FIG. 1. Guy or anchor sutures supported by forceps have been tied. These will be cut at the close of the anastomosis and will support the suture line as well as prevent kinking. Note with the traction applied the opposing serosal walls of the viscera tend to roll away from each other. This, as mentioned in the text, is due to the fact the guy sutures have been placed as close to the mesenteric border as feasible. Moist lap pads are placed under the opposing viscera and the area of anastomosis is walled off.

FIG. 2. The serosal or serosal-muscularis approximation has been begun. The suture is inserted in the center of the anastomosis between the stay sutures on the mesenteric border by continuing to roll the viscera away from each other, and after equalizing the lengths of suture tied with three square knots to form a fixation point. Medium chromic intestinal catgut No. 0 on two straight atraumatic needles is used throughout.

FIG. 3. Half of the serosal layer has been completed by continuous suture from the vantage point. This has been tied on itself with three knots at the proposed corner of the stoma as seen. The short end has not been cut as yet. The opposite half will be completed the same way and similarly tied. For ready recognition of this layer in completing the proximal anastomosis, two small hemostats may be placed on each needle. The middle layer will have one clamp on each needle, the inner layer none.

FIG. 4. At the completion of the posterior serosal layer an incision is made through all layers at once (serosa, muscularis and mucosa) instead of employing the conventional incision to the mucosa, suturing this layer, then incising the mucosa separately. The Allis clamps as seen here are never used in actual practice. Here they were applied to demonstrate the tendency of the distal layer to drop away with continued application of tension on the guy sutures. Tension on the stay sutures by keeping the viscera elevated keeps the contents from spilling into the peritoneal cavity. If deemed necessary, suction may be used. Bleeders on the borders are grasped with forceps and ligated.

tension. Therefore, suturing is more easily facilitated. In other words the preliminary sutures should be placed as closely as possible to the mesenteric border of the opposing viscera. This slight technic pays tremendous dividends in the ease of repair as well as in the preservation of the patency of the stoma. The field is then packed off with moist lap pads under and about the suture line in the usual manner.

The next step is suturing the serosa or serosal-muscularis layer. (Fig. 2.) Catgut sutures* U.S.P. "thermo-flex" (non-boilable) intestinal medium chromic type C size 0, with two straight atraumatic 1¾ inch needles in anhydrous ethyl alcohol containing 0.5 per cent benzene and 0.2 per cent thymol, are used throughout for the three layers. This resembles the Gely type of suture, i.e., arming the thread with two needles. However, the Dupuytren, Glover or Cushing stitch is usually used depending on the depth of insertion of the suture.

The suture line is started in the center of the proposed anastomosis close to the medial mesenteric border between the anchor sutures. This is done by having the assistant apply traction to the stay sutures. The needle bites are applied close to the mesenteric border by rolling each loop of bowel or viscera away from each other. This places the posterior suture line on a somewhat exaggerated tension which, as will be seen, causes it to fall away from the proximal suture line. After the needle has been drawn through both surfaces, the catgut is equalized in length before the knot is tied. Tying the knot is a very important part of the procedure for it not only keeps both lengths of the suture equal and prevents purse-string action but, more important, also fixes a vantage point in the suture line so should a break occur the layer will still remain intact as will be further explained. From this center a continuous over and over suture, the Glover stitch, is run in opposite directions through the serosal or more correctly serosal-muscularis layer to about 1 or 2 cm. from the stay suture, the size of the stoma being previously determined. At the end of the suture line which is at the corners the catgut is tied on itself fixing these points, and the short end of the suture is cut. (Fig. 3.) This now gives three focal points. The fourth tie will be on the proximal wall opposite the first knot. The stoma is now formed by incising both viscera parallel to the serosal suture line and about ¼ inch from it while the assistant applies tension to the anchor sutures. This incision is carried through all layers, serosa, muscularis and mucosa in the usual manner and is completed to just within the corners established by the tied knots of the serosal layer. (Fig. 4.) Traction of the anchor sutures prevents spillage of intestinal contents and minimizes bleeding. If spillage is threatening, suction may be used. Bleeders at this point are ligated.

The suturing of the middle layer, which is the mucosal-muscularis-serosal layer, is begun in the same mid-point on the posterior wall by biting through all layers, equalizing the suture lengths and tying the knot. (Fig. 5.) The suture is run by each needle first to one then to the other corner in the same continuous Glover stitch and the knots tied on the serosal surface using three knots.

The inner or mucosal-muscularis layer is begun and run in a manner similar to the middle layer. (Fig. 6.) For easier identification of the layers two small clamps are placed on each needle of the outer or serosal layer, a single clamp is applied to the needles of the middle layer and no clamps are then necessary to identify the inner layer.

At the corners the internal layer becomes the mucosal-muscularis-serosal layer by the application of the Connell stitch which is so applied that the suture is brought out and tied on the serosa. (Figs. 7 and 8.) From this point on this layer is

*These sutures are manufactured by Davis and Geck, Inc., product 1542, and the tubes are sterilized by immersing in alcoholic germicidal solution. Each tube contains in excess of 36 inches of catgut ready for instant use as it comes from the tube. The catgut requires no moistening.

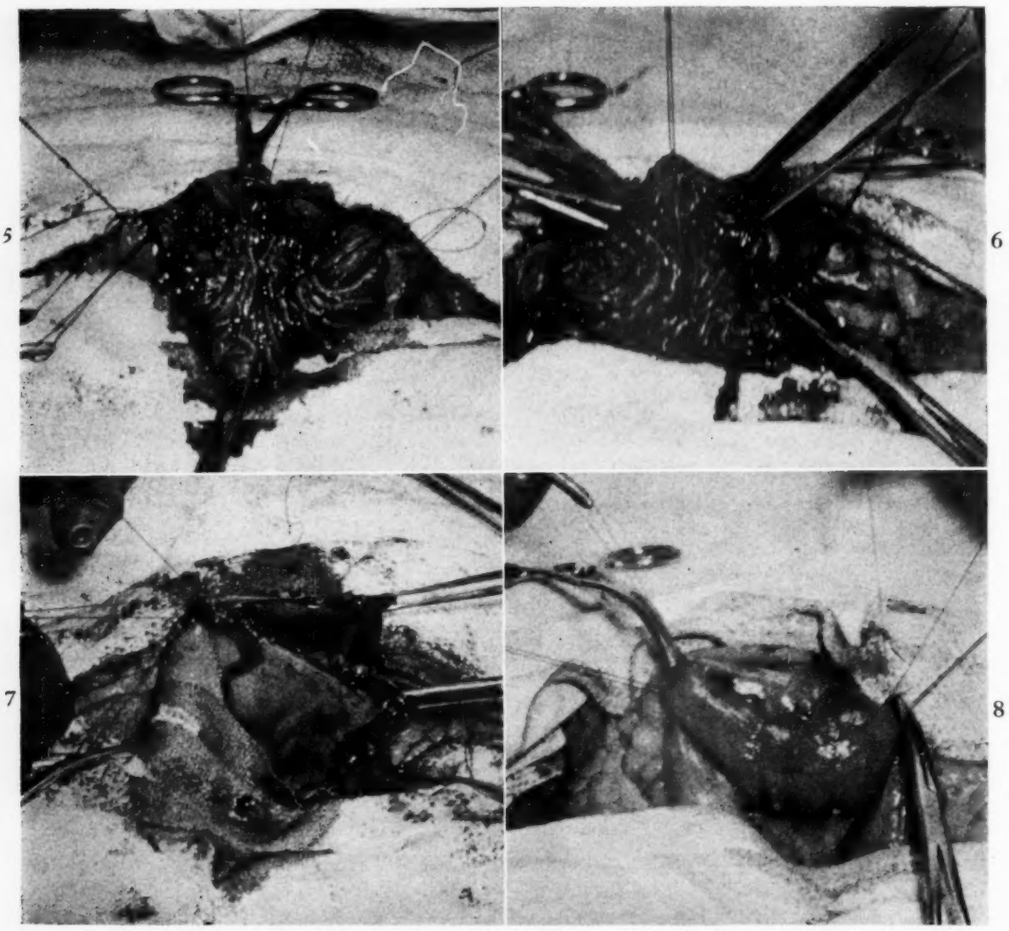


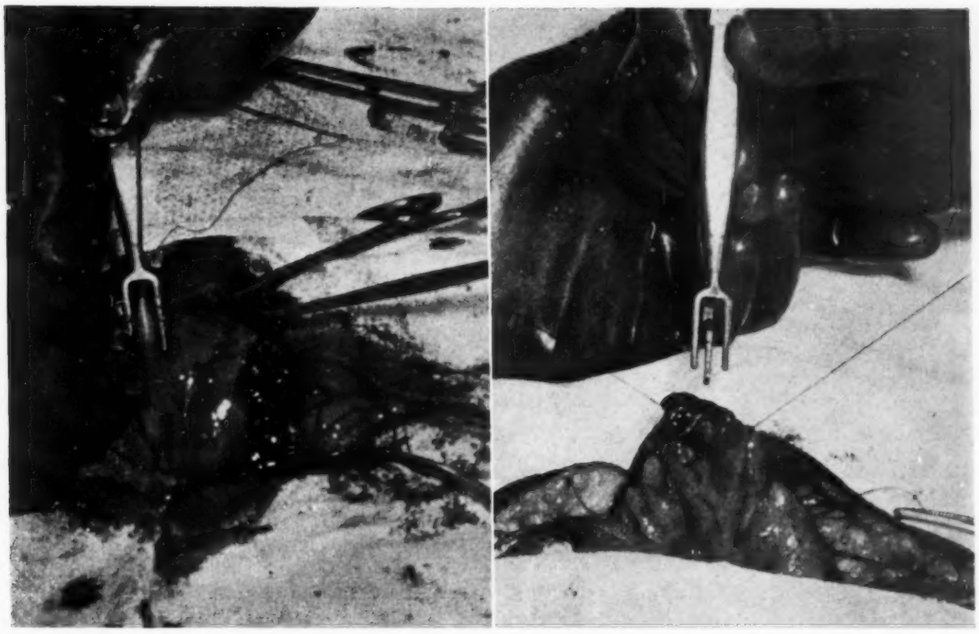
FIG. 5. The middle or mucosal-muscularis-serosal layer is similarly begun in the center of the wall. Here the initial suture has been placed and is ready to be tied. The needles are carried through all three layers in this step, are run in a continuous baseball stitch to each corner, and tied, which again is unconventional. No sutures are locked; no back stitches are taken. The short end is cut. The reason for the through-and-through three-layer suture is not so much for added strength of the suture line or more accurate approximation of layers, but for uniformity of the posterior and anterior walls. In suturing the anterior wall which is actually done from behind, all layers of necessity must be and are grasped in one bite of the needle.

FIG. 6. The mucosal-muscularis or inner layer is also begun with the central ligature which, as seen, has been tied; the same continuous baseball stitch to bring the ends of the suture outside through all three layers of bowel. The knot is tied on the serosal surface. This layer controls bleeding and will coaptate the mucosa.

FIG. 7. Shows the inner layer completed.

FIG. 8. The anterior or proximal layers are ready for suturing. The distal wall has dropped away. Note that the corners are under constant inspection.

closed (Figs. 9 to 11.) with the assistance of the Collins intestinal suturing forceps. (Fig. 12.) This instrument is used on the same principle as the Furniss anastomosis clamp, i.e., to hold together and draw up the intestinal margins so a needle may be passed underneath. As seen by the illustration (Fig. 12) it has essentially the basic structure of a tissue or thumb forceps 5¾ inches long. Its grasping prongs consist of a single-toothed prong on one side, ¾ inches long, projected forward from the blade by a ⅜ inch flange so that any tissue grasped can be projected ⅜ inches beyond the fork-like prongs of the opposite side. These single-toothed prongs as seen in the illustration are parallel ¾ inch long extensions on the same plane and level as the



9 10

FIG. 9. The anterior wall is now sutured with Collins' intestinal suturing forceps. This layer which was the mucosal-muscularis or internal layer on the posterior wall now becomes the mucosal-muscularis-serosal layer. Collins' intestinal suturing forceps, demonstrated in Figure 12, is inserted in either opposing wall consecutively at right angles to the lumen with the single prong within the lumen and the double prong outside. The prongs are inserted into the lumen to their full extent so the tissue will be grasped adequately and the needle bites of tissue will be uniform. The blades are compressed as depicted so the inner prong extrudes all layers of the tissue through the fork-like portions as seen. The needle is passed between the single and double teeth, through all layers, ¼ to ⅜ inch from the margin and parallel to it, the suture is drawn through and the forceps then withdrawn to be reapplied to the opposite side in the same manner. This technic is very rapid and one becomes quite dexterous with this instrument. It has the advantage of rolling the mucosa inside where it becomes perfectly approximated to its fellow, keeping the opposing walls of equal and uniform length by gathering up slack and preventing inadvertent suturing of the dorsal to the proximal mucosa. This continuous suture is carried to the mid-point between the stay sutures where it is tied to its fellow from the opposite side.

FIG. 10. Shows the insertion of Collins' intestinal suturing forceps; half of the layer has been completed. The next layers are sutured in the same routine continuous manner from each corner and similarly tied in the center.

blade from which they extend as a double-pronged tine, ¼ inch apart.

There is a distinct advantage to the three-layer suture method as practiced here. It not only gives added strength, controls bleeding and coapts the layers but also makes the distal and proximal walls uniform as shown.

The preoperative preparation is the usual routine for getting the patient in optimal condition. In the choice of anesthetics one of us (J. K. S.) uses ether almost exclusively replacing spinal anesthesia; the other (S. L. S.) uses sodium pentothal-curare anesthesia.

### POSTOPERATIVE CARE

The patient is placed in a Trendelenburg position on his return from surgery by elevating the foot of the bed. An abdominal binder encircling the operative site is applied and an ice bag is placed over this. The binder, in addition to giving the patient abdominal support, gives him confidence. The ice cap provides anesthetic features and by constricting blood vessels decreases the rate of blood flow thereby decreasing tissue metabolism, limiting infection and promoting healing. If indicated following extensive or prolonged

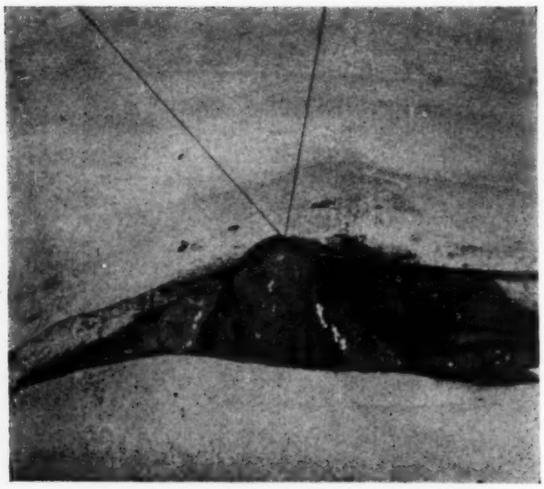


FIG. 11. The anastomosis has been completed.

surgery or in debilitated or aged patients, an oxygen tent is used.

When the patient responds, deep breathing exercises are encouraged every hour to prevent atelectasis or other pulmonary complications. Routine care with intravenous fluids, 5 per cent glucose in saline solution with the addition of vitamin C and vitamin B complex as advocated, is given as needed. Amino acids are also supplied intravenously if necessary. Oral intake is prohibited the first day; sips of warm liquid, usually tea, is begun the second day. The Levine tube is only used if abdominal distention threatens. One of us (S. L. S.) practices early ambulation, walking the patient to the bathroom within the first twelve hours of surgery; the other is slightly more conservative. Enemas are given on the third day and the diet is gradually increased. The patients are usually discharged from the hospital between the fifth and tenth days depending on the clinical recovery.

## SUMMARY

1. The principles and aims of successful intestinal anastomosis are outlined.

2. The complications and dangers of anastomosis are discussed with cautions and methods of prevention as suggested by the literature.

3. The chief complications are hemorrhage, leakage, peritonitis, stomal obstruction, inadequate stoma, adhesions and death.

4. The chief causes for these complications are sutures tied too tightly, sutures improperly applied, careless coaptation of the layers, improper attention to the mesenteric angle, improper attention to adequate blood supply, excessive handling of tissues and the injudicious use of clamps.

5. The literature is of the unanimous opinion that the greatest danger point for leakage is the mesenteric angles. A continuous, absorbable, preferably fine catgut is best for the mucosal layer.

6. A technic of open anastomosis is outlined using tanned catgut in three layers with the Collins intestinal suturing forceps.

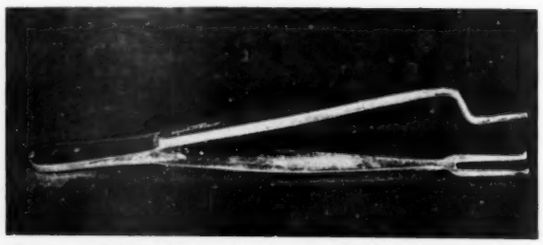


FIG. 12. Collins' intestinal suturing forceps; note how the flanged single tooth can push tissue through the fork-like prongs in a uniform manner. This instrument is 5¾ inches long. Each prong is ¾ inch long. The single prong is directed forward from the blade by a ⅜ inch flange. The double prongs are ¼ inch apart. This instrument is listed in v. Mueller's catalog for 1948 as GO-2056.

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Patients submitted to vagotomy alone and those upon whom gastroenterostomy or pyloroplasty was done in addition have been studied and compared by gastroscopic investigations. According to what is seen by such examinations, vagotomy tends to induce more ulceration instead of less. Vagotomy separates and protects the gastric mucosa from psychic trauma but it apparently renders this same gastric mucosa more susceptible to ulceration and trauma. Only if a coexistent gastroenterostomy is performed and it functions well is the gastric mucosa likely to be protected. This is due to the increased rate of emptying of the stomach contents and the reflex of alkaline gastric contents into the stomach as a result of the gastroenterostomy or the coexistent pyloroplasty. Here we have direct visual evidence that vagotomy is not worth while. (*Richard A. Leonardo, M.D.*)

# POST-TRAUMATIC REFLEX DYSTROPHIES*

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AT various times a group of conditions following injury has been described which may be generically termed post-traumatic reflex dystrophies. These conditions are probably different manifestations of the same disturbance. They have been called a variety of names such as état physiopathique, minor causalgia, causalgia,† Sudeck's atrophy, post-traumatic painful osteoporosis, chronic segmental arterial spasm, chronic traumatic edema and peripheral trophoneurosis.[1,2] They are common and often misdiagnosed as functional or hysterical complaints. However, the syndrome presents characteristic features and if diagnosed and treated early usually responds to the correct therapy.

## CLINICAL ASPECTS

Reflex dystrophies follow trauma and are characterized by pain, vasomotor changes and altered motor function.[3–5] The trauma is typically mild and directed to the small bones of the wrists, hands, ankles and feet. It less commonly follows injury to the diaphysis of long bones or severe injuries. Many types of injury set off the process, namely, strains, sprains, bruises, lacerations, wounds, fractures, operations, amputations, infections and arthritis. The inciting agent may be more diffuse as in thrombophlebitis, burns and frostbite or may begin in the spinal cord as in poliomyelitis, tabes dorsalis, combined degeneration or myelitis. It may even be central as in brain injury, infarction, tumor or inflammation.

There are wide variations in the pain; it may even be absent. In general it is more severe than the nature of the injury ordinarily would warrant. It is diffuse and deep, sometimes burning, hard to localize and occasionally paroxysmal. It may not conform to anatomic patterns and may be glove-like or stocking-like. Hypesthesia may be present. Adequate immobilization usually will not relieve the pain; manipulation aggravates the symptoms. Venous compression sometimes will increase the pain and suprasystolic compression cause it to disappear. One or more trigger points may be present.

The primary vasomotor change is vasodilatation, which is always present. Miller and deTakats showed phlethysmographically that the average increase in blood flow in the affected side as compared to the normal was 30 per cent.[4,5] The skin temperature is elevated and there are increased oscillations as seen in the oscillograph. This stage may be transitory or may last for years. It must be present for at least four to eight weeks for spotty decalcification of bone (Sudeck's atrophy) to be seen by x-ray.[4] In most patients vasodilatation passes off and vasoconstriction sets in. There is then pallor, cyanosis, coolness and increased sweatiness. Hypertrichosis may appear and the nails may become brittle and ridged. In both phases edema of the subcutaneous tissues, poorly localized to the injured focus, and glossiness of the skin may be found. These are more marked in the phase of vasoconstriction. The change from one phase to another is gradual and undramatic. Most patients are seen when vasoconstriction is present. At this time the soft tissues have begun to be or already are atrophied.

DeTakats has divided the complex into

† We reserve the term "causalgia" to signify the pain syndrome in an extremity following partial or complete division of a peripheral nerve. It will not be considered in this paper.

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three phases.[2] In the first there is persistent burning pain, fairly well localized, with paroxysmal exacerbations following jarring, air currents or emotional upsets. The extremity is warm and dry. The subcutaneous and periarticular tissues are edematous and the muscles are spastic. The pain is limited to the site of injury. Oscillometric studies show an increased circulation to the part but osteoporosis cannot be seen by x-ray. The syndrome may be aborted here or continue on to the second stage, that of spreading neuralgia. The pain is now more diffuse, hyperalgesic and not of a segmental distribution. The periarticular edema has spread. There is still a tendency toward vasodilatation but the part is cooler and perhaps hard and cyanotic. The joints are stiff and the muscles show early atrophy. Osteoporosis is present. During this period pain may rarely appear in the opposite limb as a mirror image.[3] Finally the pain becomes fixed and intractable. Atrophy progresses and diffusely involves skin, muscle and bone. Trophic changes are striking.

The course is extremely variable. Vasomotor signs may completely dominate the picture, e.g., Raynaud's phenomena. There are mild types healing spontaneously in a few weeks or rapidly responding to therapy. There are cases of moderate severity with continuous pain and disability, increasing contractures and decalcification. These may be self-limited and heal in a year or so or respond to adequate treatment. Finally there is the severe form with spreading neuralgia, marked osteoporosis and mental fixation on the intractable pain. Patients with this severe type often end up in mental institutions. The course does not parallel the severity of the injury and is more easily changed the earlier the treatment. The complex is less common after more severe injuries.

Radiologic changes are merely one phase of the process. Fontaine and Hermann[6] describe two types of x-ray appearance. In the acute form the mottled look is due to irregular rarified foci in the spongiosa. This mottling is most marked in the carpals and tarsals and in the heads of the metacarpals and metatarsals. Osteoporosis is not seen on the roentgenogram until 15 to 20 per cent of the calcium is lost from a bone. In advanced cases the cortex becomes very thin. The chronic form presents very fine trabeculations and a general loss of calcium. Finally the small bones may fuse and calcium may be deposited in the joint capsule. After a bone becomes rarified to any great extent it rarely regains its original density. However, complete anatomic restoration of the density is not necessary for complete symptomatic relief. Fontaine and Hermann express the opinion that after the disease has reached its climax of maximum decalcification, recalcification begins spontaneously although years later the x-ray may show a thin cortex and thin lamellas and irregular areas of recalcification. DeTakats points out[2] that the diagnosis cannot be made by x-ray. The diagnosis must be clinical. The syndrome may be absent in the presence of osteoporosis or may be subsiding when bone changes are at their height; nor does the pain follow the course of the osteoporosis.

Is there an emotional background for this ailment? Leriche has said that "causalgia is a disease which must be regarded as a function of the temperament of the individual."[7] Livingston does not accept this point of view.[8] In any case many of these patients are highly emotional. Often symptoms are aggravated by mental upsets. A final answer must await detailed psychiatric studies.

## MECHANISM

In certain people an injury may start a cumulative process which is not confined to the distribution of a single nerve and which tends to spread and be followed by diffuse reflex phenomena. The nature of this cumulative process and the reasons for its spread have never been satisfactorily explained.

Lewis suggests[9] that a focus of irritation

stimulates efferent vasodilator fibers either through axon reflexes or posterior root vasodilators. These produce a substance or substances which are responsible for the pain and vasodilatation. The benefit of attack on the sympathetic nerves, with this theory as a basis, would lie in a washing out of the pain-producing substances. DeTakats further postulates[4] that if there is arteriolar dilatation and capillary spasm, the pulse wave will stimulate the sensory receptors with production of pain with each pulse beat. Sympathectomy here would release venocapillary obstruction.

Several authors have proposed the existence of afferent sympathetic fibers.[10] However, the great bulk of experimental evidence fails to support this interpretation.[11] If the pain sensation were carried by the same fibers which bring about vasodilatation, the sympathetic fibers, then blocking or cutting these fibers should decrease the vasodilatation; yet it has been shown[5] that in patients with post-traumatic vasodilator dystrophies there was further increase in blood flow after sympathectomy although pain was abolished.

Livingston constructed the following theoretical chain of events:[8] Following an injury a focus of irritation is set up. This sends a sustained barrage of impulses to and through a pool of many neurons in the central nervous system, the so-called internuncial pool. These nervous impulses summate and disturb the normal equilibrium. Incoming impulses are shunted and register a changed pattern on the conscious mind. Continuous activity in the pool affects anterior and lateral horn cells. This results in muscle spasm and vasomotor abnormalities which in turn furnish new sources for pain impulses. As the intensity of this self-sustaining process increases, other systems within the central nervous system are drawn in and pain and sympathetic disturbances are found a varying distance from the injured region. Under this theory the value of sympathectomy would lie in breaking the cyclic reflex at one point.

Doupe, Cullen and Chance[12] have put forward the hypothesis that the pain is caused by efferent impulses in the sympathetic fibers stimulating the afferent spinal nerves at the point of damage or possibly at the nerve endings. It has been shown[13] that an artificial synapse could be set up after a nerve injury. Under this hypothesis sympathectomy cures the pain syndrome by inactivating the efferent fibers which are stimulating the axons at the site of injury.

## TECHNIC

The syndrome is better prevented than treated. Prevention is best obtained with early and adequate treatment of pain by immobilization, analgesics and nerve block or infiltration of painful foci with local anesthetics. Foci of irritation should be vigorously combated with whatever surgical, orthopedic, medical or physiotherapeutic means are indicated.

Once the condition is present, the earlier treatment is instituted the more likely will there be a favorable response. This cannot be emphasized too strongly. Treatment aims to break the cyclic reflex at some point. Trigger points should be infiltrated with a solution of local anesthesia or excised. If they are not found or if treating them does not halt the progression of symptoms, attack on the sympathetic system must be carried out. In its simplest form this consists of paravertebral sympathetic blocks or the use of sympathetic blocking drugs. More often than not, surgical attack on the sympathetic nervous system must be performed.

In the final severe and fixed stages of reflex dystrophies there is need of surgical treatment directed at the spinothalamic tract, sensory cortex or frontal areas.

## CASE REPORTS

The following four case reports have been selected from our series as typical of the syndrome:

CASE I. C. G. (Boston City Hospital, Outpatient Department, No. 819490), a forty-one

year old woman, fell at home and sustained a fracture of the distal end of the right radius and right ulnar styloid. A few hours after the injury the fracture was manipulated under pentothal anesthesia and a sugar-tong, plaster-molded splint applied. After the reduction the patient complained of a burning, squeezing pain in the muscles of the forearm and in the wrist and hand. The cast did not appear too tight but because of the patient's complaints it was changed. The patient stated that she got no relief and the cast was changed four times in the first ten days postfracture. On the tenth day a dorsal sympathetic block (D1 and D2) was performed. There was immediate relief. This continued and the patient went on to an uneventful convalescence.

Case II. E. F. (Boston City Hospital, Outpatient Department, No. 823331), a forty-seven year old white woman, fell at home in April, 1947, and sustained a comminuted fracture of the distal end of the left radius extending into the radiocarpal joint and a fracture of the left ulnar styloid process. Within an hour the fracture was reduced under pentothal anesthesia. A good reduction was obtained. There was more pain than usual all through the period of immobilization which lasted five weeks. The patient was seen three weeks after the plaster splints were removed complaining of pain, a sense of constriction in the muscles of the forearm, hypesthesia and ache in the wrist, stiffness of the fingers and episodes of coldness and pallor of the hand. The skin of the hand was smooth and glossy and the fingers painful on motion. X-rays showed the spotty decalcification characteristic of Sudeck's atrophy. Priscoline® (2-benzyl-4,5-imidazoline hydrochloride)* was given in doses of 50 mg. four times a day for four days. Hypesthesia and pain disappeared on the evening treatment was begun. There was no recurrence of the pain or temperature change and the fingers felt "looser" and not as stiff. When the patient was seen five months after injury, her hand appeared normal and she was carrying out housework without discomfort.

Case III. M. L. (Boston City Hospital, Outpatient Department, No. 828306), a twenty-nine year old woman, was first seen in July, 1947. In August, 1946, she sustained a laceration of the flexor tendons of the thumb, index and long fingers of the right hand. Cleansing and primary suture were done a few hours after the injury. The wounds healed by first intention. After function began to return there were episodes of pain in the previously injured digits, associated with a feeling of coldness. Since April, 1947, there had been a constant, dull, diffuse ache extending down from the wrist into the palm and affected fingers, sharply demarcated coldness and cyanosis of the affected fingers and median side of the palm, hyperhidrosis of the same distribution and stiffness of the hand. Physical examination revealed striking coldness, cyanosis and sweatiness of the thumb and the index and long fingers. The fourth and fifth fingers were warm, pink and dry. The skin of the thumb, index and long fingers was smooth and glossy. Thumb motions were essentially normal. Flexion of the index and long fingers was about 60 per cent of normal. There was marked weakness of the hand. The involved digits were hypo-esthetic. The patient was given an 8 cc. intramuscular dose of etamon® (tetraethylammonium chloride),† following which she became dizzy and was nauseated. There was ptosis of the upper eyelids and the pupils became dilated. All symptoms passed in about ninety minutes at which time the pain in the hand was gone and the thumb and first two fingers were warm, dry and pink for the first time in months. Five days later there had been no loss of improvement and some of the glossiness had begun to disappear. She was given 6 cc. of etamon® intramuscularly. The hand remained warm, dry, pink and free of pain. The cutaneous glossiness gradually disappeared. When the patient was last seen, there was an increase of about 15 per cent in motion and strength.

Case IV. A. B. (Boston City Hospital, No. 1262897), a thirty-four year old white male, was admitted in October, 1947. Three months previously he tripped stepping off a platform and sprained his left ankle. Pain and swelling appeared but the patient continued to work. The pain was sharp and shooting, beginning over the lateral aspect of the metatarsal arch and radiating to the ankle. The foot was swollen during the day but the swelling went down at night. The foot felt hot and walking became difficult. The patient was treated with hot soaks and rest without relief. Examination

* Generously supplied by Dr. F. Yonkman, Ciba Pharmaceutical Products, Inc., Summit, N. J.

† Generously supplied by Dr. E. C. Vonder Heide, Parke, Davis & Company, Detroit, Mich.

on entry showed non-pitting edema of the foot and ankle, stiffness of the ankle and an elevated skin temperature as compared to the other foot. X-rays showed spotty decalcification of the tarsals and metatarsals. He was given 5 cc. of etamon® intramuscularly every four hours for three days. Within an hour of the first injection the foot felt "looser." Swelling disappeared as did most of the pain. Several days after the drug was stopped the symptoms recurred. A lumbar sympathectomy was performed with relief of symptoms.

SUMMARY

A diverse group of clinical conditions make up the syndrome of post-traumatic reflex dystrophies. They are common, follow injury and present pain, vasomotor changes and altered motor function. There is great variation in each of the characteristic features and any one may dominate or may be absent. At times the x-ray shows spotty decalcification of bone. This is not an integral part of the syndrome. The cause for the appearance of this syndrome is obscure. It is usually disabling and almost always responds to early treatment. Late treatment is far less satisfactory and sometimes fails because of the complications of fibrotic and trophic changes.

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# AVOIDANCE OF URETERAL INJURY BY ROUTINE PALPATION DURING TOTAL HYSTERECTOMY

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THE danger of ureteral injury is ever present in major pelvic surgery and with a greater trend to total hysterectomy there will be a proportionate increase in the number of damaged ureters. Many surgeons have advocated preoperative catheterization of the ureters as an aid to its palpation and to facilitate its exposure. In the course of our work we have gradually evolved a simple method of palpating the ureter which is so uniformly satisfactory that it largely eliminates the danger of ureteral injury.

In the performance of total hysterectomy the ureter is palpated just before the uterine artery is ligated. The uterus is drawn to the opposite side by rather firm traction with the object of tensing the uterosacral ligament. The index finger is placed on the tense uterosacral ligament and is then slid out laterally along the ligament to the side wall of the pelvis. The ligament stands out rather sharply and has a fairly definite caudad and cephalad surface. The thumb is then placed opposite the index finger in the raw, deperitonealized, anterior surface of the ligament. The two fingers are opposed and drawn toward the cervix using the caudad surface of the uterosacral ligament as a guide. As the fingers pass over the ureter it is clearly felt and jumps just as does the vas deferens when palpated in the scrotum. The ureter may be found anywhere from 1 to 4 cm. lateral to the cervix. In dividing the uterine artery it is advisable to carry the incision through the cervical fascia for about 1 cm. or more anterior and posterior to the artery. This allows the ligated artery to drop away from the cervix and facilitates the placing of all subsequent clamps medial to the ligated uterine artery. As is well known, this is valuable in preventing ureteral damage. Palpation of the ureter can also be very helpful during the reperitonealization of the pelvis. The ureter often lies very close to the cut edge of the posterior peritoneal leaf. Unless care is taken to determine its position, it may be caught with a closing stitch.

This method is now routinely used by the authors and we believe it has been valuable in preventing ureteral injury.

# Streamlined Articles

## MODERN TRENDS IN COLON SURGERY

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THE value of any refinement in surgical technic must be proven. Time alone will give us the answer; the "pull-through" procedure is highly controversial. The indications and contraindications of the various refinements are mentioned. An attitude of fair-mindedness and tolerance will be necessary and helpful until the full value of these procedures has been appraised.

* * * *

During June, 1948, to June, 1949, approximately twenty-four surgical operations were performed at the Binghamton City Hospital for malignancy of the large bowel. Over a century ago Reybard[1] successfully removed a sigmoidal cancer and restored intestinal continuity by primary anastomosis. Ever since that time surgeons have recognized the challenge and endeavored to accomplish two things: first, resect widely the existing malignancy and, secondly, devise and improve the technical aspects of a necessary anastomosis. It is only in the past ten years that such operative feats have been compatible with low operative mortality. The early mortality has been lowered only in proportion to a necessary knowledge of the basic physiology, biochemistry and refinements in operative technic. About fifty years ago "exteriorization" as devised by Block, Paul and Mikulicz was hailed as the answer. This principle was brought to its highest perfection by Rankin with his so-called "obstructive resection" in 1930. Rapid strides were made during the war years and those of us who were fortunate enough to have used the principle of exteriorization in surgery of the large bowel soon became convinced that the difficulties involved were many. Gibbon and Hodge[2] report that the mortality from the exteriorization operation is twice as great as from resection with end-to-end anastomosis. When the malignant lesion to be resected lies between the cecum and rectosigmoid junction, resection with primary anastomosis can usually be done and is superior to any other method. Preliminary ileostomy, appendicostomy or colostomy is necessary only in complete obstruction.

More than one-half of the lesions (rectum, 69 per cent and colon, 60.8 per cent) will have metastasized to the regional nodes before the patient comes to surgery. Normal lymph flow coincides with venous blood flow almost entirely except for some lateral spread. A small-sized lesion can have extensive and far removed metastases. This makes us realize that while lymphatic spread probably accounts for most of the metastases, venous implants do occur. Extension by local growth and wound implants is certainly far less common.

The distribution of the twenty-four lesions encountered and a presentation of the operative procedures used has been tabulated. (Table 1.) On the right side, from the cecum and ascending colon up to and including the hepatic flexure, it often happens that the local spread is extensive. True, the operative mortality is a bit higher than that for resections on the left side, but the number of five-year survivals is far greater. Because of this only a wide resection will satisfy. Excision of the entire right colon

with a portion of the terminal ileum, hepatic flexure and transverse colon to the left of the mid-colic artery should be done. Preliminary ileotransverse colostomy as a stage procedure with the hope of excision at a later date seldom materializes. Complete obstruction is rarely a factor to be dealt with, but inoperability because of local fixation leaves with one the profound impression of the necessity of early diagnosis. Change in bowel habit, undetermined secondary anemia and weight loss are the most common early symptoms. A palpable mass will not too frequently be resectable.

TABLE 1

| Location of Lesion | Operative Mortality (per cent) | No. of Cases | Average Age (yr.) | Sex | Pathologic Diagnosis | Type of Resection | Average Hospital Days |
|---|---|---|---|---|---|---|---|
| Cecum ascending colon | 100 | 3 | 72 | M 1<br>F 2 | Adenocarcinoma 3 | Right colectomy 2; abdominal laporatomy; patient died on table | 40 |
| Transverse colon..... | 0 | 3 | 81 | M 1<br>F 2 | Adenocarcinoma 3 | Mikulicz 3 | 36 |
| Descending colon..... | 33 | 9 | 56 | M 2 | Adenocarcinoma 8; no biopsy 1 | Mikulicz 1; resection and anastomosis 4; loop colostomy 2; inoperable 1; Miles' 1 | 27 |
| Sigmoid pelvic colon.. | ... | .. | .. | F 4 | | | |
| Rectum..... | 0 | 9 | 71 | M 6<br>F 3 | Adenocarcinoma 4; papillary adenocarcinoma 3; epidermoid carcinoma 1 | Divided colostomy 2; loop colostomy 3; Babcock pull-through 1; inoperable 1; Miles' 1 | 41 |

The transverse colon and the sigmoid loop are the two areas in which many surgeons believe that the principle of exteriorization should be used. Jones[4] states that he has a bit lower operative mortality in this area (transverse colon) by using that procedure. However, the attachments of the gastrocolic omentum and transverse mesocolon with their rich lymphatic and blood supplies call for a wide resection. Preservation of blood supply to the bowel ends being anastomosed is a fundamental principle. To affect this it sometimes becomes necessary to mobilize the splenic and hepatic flexures. This maneuver allows for a greater portion of the transverse colon to be resected, the blood supply preserved and, equally as important, the anastomosis will not be taut (or under tension).

Lesions of the left colon constitute a small number until the rectosigmoid junction is reached. A high splenic flexure can be the most difficult area in the entire colon to mobilize, but with adequate abdominal incision and careful dissection one is frequently surprised. It is only then that the surgeon realizes a radical excision can be accomplished. The entire left colon down to the beginning portion of the sigmoid loop with a wide swath of the sectional mesocolon can then be removed and a primary anastomosis between the transverse colon and sigmoid loop established. Difficulty can be experienced in periotonealizing the area from which the splenic flexure was removed. It is not good surgery nor is it entirely safe to leave this area denuded of its peritoneal covering. I know of no better use of the Mikulicz pack than in this particular locality.

The sigmoid loop is of great importance because it is here that a large number of lesions are encountered. A stenosing, napkin-ring type is most common. In this same area diverticulitis in its various forms is also frequently found. When confronted

with a differential diagnosis in this area one has a problem of real magnitude. A proximal colostomy would certainly be the ideal answer as a stage procedure if an unequivocal diagnosis could be made of diverticulitis. More frequently, the typical stenosing lesion of malignancy is found (it may be small) and one may be surprised to find liver metastases. If no liver metastases are present, a wide resection with removal of the inferior mesenteric group of nodes is indicated. The so-called critical point of Sudeck is a nice academic refinement, but of more value is the presence of copious bleeding from the ends of the bowel to be anastomosed. In the event of liver metastases a palliative resection is indicated and is a very worth while procedure.

The rectal ampulla is the most common site in the entire colon to be invaded by neoplastic change. Over 80 per cent of the lesions will be above the mid-portion of the rectum. Developments unearthed within the past few years (Gilchrist and David,[5] McVay,[6] and Coller, Kay and McIntyre[7]) show that it is most unusual to find tumor cells 2.5 cm. or 1 inch below the palpable tumor mass. It is now time to re-evaluate our concepts in regard to lymphatic spread. The upward spread is extensive and a definite happening; lateral spread in lesions at the level of the levator muscles is a strong possibility. However, true downward spread is unlikely. With this thought and a full realization of a far reaching (not common) upward spread due to venous return, there is no conflict with sphincter-preserving operations. Babcock and Bacon have modified the Hochenegg procedure and do equally as radical a piece of surgery as is possible with Miles' operation. I am convinced that the construction of a peritoneal diaphragm carries with it the possibility of recurrence in the form of peritoneal implants. The low anterior resections as performed by Dixon and Wangensteen are difficult in a technical way and, if done at a low level, proximal colostomy as a temporary measure is mandatory. Both Babcock and Dixon[8] have a higher percentage of five-year survivals (58.5 per cent) than those reported from centers doing the orthodox Miles' operation (46.3 per cent).[9] I hold no brief for procedures done from below without abdominal explorations and, strangely enough, someone will revive the Lockhart-Mummery (perineal excision) operation every now and then. In low-lying lesions Miles' (orthodox) abdominoperineal resection is the procedure of choice and the operations for sphincter preservation are definitely contraindicated.

A fair, non-biased appraisal of present day concepts in regard to malignant lesions situated in the rectal ampulla or rectosigmoid has an ever increasing number of converts to the sphincter-preserving types of operation.

Proper preoperative care and chemo- and antibiotic therapy now allow as the procedure of choice open anastomosis. Modifications of the Furniss clamp and the Parker-Kerr basting stitch come close to a closed anastomosis, but in so doing only a seromuscular coaptation is achieved. Open anastomosis allows not only for seromuscular approximation but also, of as great importance, for mucosal approximation. Hemorrhage from the mucosal layer has been reported with closed procedures. However, of more importance is failure of accurate approximation of the layer of the mucous membrane and in so doing the incidence of stricture formation is very apt to be a factor.

The air vent drains as devised by Wangensteen and Chaffin are a great improvement over the Babcock sump drain and of definite value if one decides upon the necessity of drainage.

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It is well known that many cases of achalasia of the esophagus go on to irreversible esophageal changes. Cardiospasm present is often associated with organic changes in the cardiac portion of the stomach and adjacent esophagus as well as with simple imbalance of the autonomic nervous system. It seems logical, therefore, to recommend surgery when simpler measures fail to attain success. The narrowed passage may be widened by a technic similar to the Finney pyloroplasty procedure. In other cases, unless one wishes to resect the stenosed area because of a more advanced pathologic condition and do an immediate anastomosis, a successful result can occur following the Heineke-Mikulicz technic. This is done for pyloric stenosis wherein a longitudinal incision is made through the involved area, between stomach and esophagus, and it is closed in a transverse manner to make the lumen more patent. Successful results can occur after all such procedures whether performed via the transpleural or transperitoneal route. Often, however, fewer complications occur following the latter route and it may be simpler for general surgeons who do not have too much experience in performing thoracic surgery. (*Richard A. Leonardo, M.D.*)

# PLASTIC SURGERY ABOUT THE EYE

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VARIOUS procedures and operative techniques are presented for use in plastic surgery about the eye. Implants of autogenous, homogenous and foreign materials may be required. The patient's psychologic make-up, coupled with the surgeon's ability to do standard procedures well and modify them where necessary, will guide the course of the individual case.

1A 1B 1C

FIG. 1. Reparative surgery about the eye. A, injury resulted from an automobile accident. The upper lid presents loss of tissue, the medial canthus is displaced, the eyebrow position is asymmetrical, there is a scarred area over the zygoma, and the sideburn stands out as a thick raised flap. B, the eyebrow has been transferred to a more normal position with a Z-plastic operation. A hinge flap has been swung from the lower to the upper lid. The lids have been sewn together for immobilization. C, following surgery with functional and cosmetic improvement; patient was taken to tattoo artist's parlor for impregnation of dyes into a small area on the upper lid.

* * * *

Reparative procedures about the eye require both planning and patience. It is often difficult to know when there is more to be done and when the reconstructive procedures are finished. The plastic surgeon must be prepared to handle the patient psychologically.

The surgeon's imagination is catalytic to standard procedures. The individual case will require specific planning. An end result with functional, physiologic and cosmetic improvement is the surgeon's goal. The simplest procedure that will work is the method of choice. Spectacular methods that appear proper on paper or even at the operating table may prove disappointing with time.

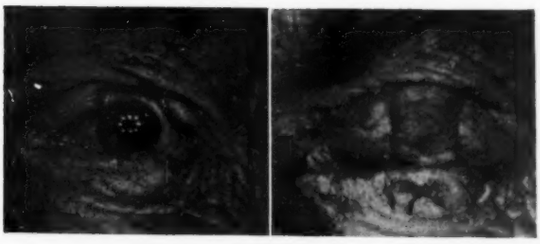
The extent and location of the defect will guide the choice of operation and the number of procedures for repair. To repair deformities the following tissues and technics may be employed, namely, local tissue shifted by undermining or relaxing incisions, Z-plastic operation, "V-Y" procedure, sliding flaps, adjacent pedicle flaps, distant pedicle flaps, composite grafts, skin grafts, dermal fascia fat grafts, mucous membrane, fascia, cartilage, bone and metals.

## LOCAL TISSUE

*Excision and Closure.* Tissue shifted from the adjacent vicinity is ideal to repair a defect. (Fig. 1.) Its character and color most closely simulate the surrounding skin of its new abode.

Often, early x-ray or radium on the surgical site will lessen the chance of a heavy scar. Such a procedure is especially applicable when the area has been burned or the patient has a tendency toward keloid formation.

*Relaxing Incisions.* A lesion about the eye requiring resection may be too large for primary closure. In such a case adjacent relaxing incisions may be used. This type



2A 2B

2C 2D

FIG. 2. Repair of upper lid defect. A, squamous cell carcinoma was resected from the upper eyelid, after which the patient was referred for plastic repair. B, corneal ulceration and discomfort necessitated reconstruction of the upper lid. C, a flap was created above the defect and caterpillared downward. The eyelids were sewn together to gain immobilization. D, satisfactory functional result was obtained and corneal irritation cleared.

is especially pertinent around the eyelid where an excision of too large an area may result in ectropion.

Meticulous undermining and total hemostasis are prerequisites to such a procedure. The nearby relaxing incision may be closed directly by shifting tissue or, if it be too large, it may be grafted.

*Multiple Excision.* A defect that does not allow resection and closure in a single procedure may be eradicated by multiple excision. At the initial procedure an elliptical incision is made through the center of the lesion. In this specific case radical undermining of the wound edges is avoided which will produce less induration and allow the secondary operation at an earlier date. Several months later, when the induration has subsided and the skin has been allowed to stretch, the remainder of the deformity is resected along with the previous scar. The final result presents a single scar.

## TECHNICS

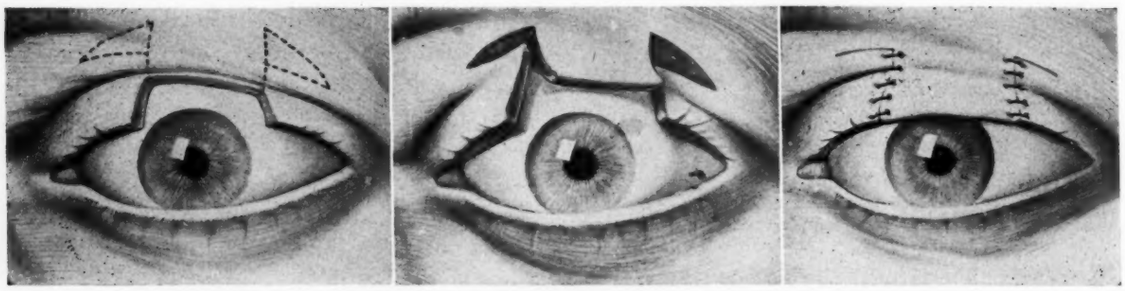
*Z-plastic Operation.* Loss of skin around the eye may present annular or "check rein" scars. The single or multiple Z-plastic operation may be employed to ameliorate such a condition. If the scar is especially long, two or three smaller Z-plastics may be carried out along its route.

The Z-plastic operation may be employed for shifting tissue, such as a hairy nevus, an angioma or a burn scar away from the eye onto the face. From this latter area it may then be resected by single or multiple excision.

*Pedicle Flaps and Tubes.* The loss of tissue about the eye following injury or radical surgery for malignancy or congenital deformity may require a skin flap. Depending upon the nature of the deformity and the discretion of the surgeon, the choice of flap or pedicle will vary. (Figs. 2 and 3.)

Flaps may be obtained from the forehead in various modifications, namely, the median forehead flap, the sickel flap,[6] the center forehead flap (Oberonne and Nelatin) and the island flap. In each case the flap is best delayed once or twice and then rotated to its desired position. The donor site may be closed directly, if it be a small pedicle flap, or grafting may be required with a large central flap. At a later stage the skin graft or part of it may be excised so as to leave a smaller defect at the donor site.

Cheek flaps from the adjacent area may similarly be raised and swung into position over the defect.[1] Flaps may be employed



3A 3B 3C

FIG. 3. Caterpillar flap for reconstruction of upper eyelid defect. A, the lines of incision to create the caterpillar flap are marked off. A triangle of tissue on each side is resected, allowing the flap to slide downward. B, edges of the defect are freshened to accept the flap. C, catgut sutures, No. 6-0, are used subcutaneously and silk sutures, No. 6-0, employed to approximate the skin edges.

4A 4B

FIG. 4. Skin grafting of the eyelid and blepharopoiesis. A, destruction of tissue following a burn about the eye. B, following reparative surgery with functional and cosmetic improvement.

from the upper lid for the lower lid and vice versa.

The tube pedicle described by Filatov, Ganzer and Gillies may be applicable to selected cases. If possible the tube should be raised from the supraclavicular area or a neck tube is used thus obtaining tissue simulating that about the face.

The pedicle is tubed and then usually in stages migrated to its new residence. The donor site is approximated by undermining the adjacent skin and suturing the latter. The end of the flap may be turned on itself or skin grafted when internal lining is required.

After the induration has subsided, the flap or pedicle may be raised two or three times and thinned. Such effort on the surgeon's part will result in a more favorable functional and cosmetic end result.

*Composite Grafts.* Tissue taken from the ear, either the anterior attachment of the helix or from the rim to include skin on each side with cartilage in the center, may be utilized to reconstruct the lower lid. The graft is meticulously sewn into position and reasonable pressure is applied.

*Skin Grafts.* When a graft around the eye is required, skin of full thickness or near full thickness that most closely simulates the area of the defect should be chosen. (Fig. 4.) To graft an upper lid skin from the opposite upper lid is best. But if the deformity be large and a more expansive donor site be required, then a full thickness graft may be garnished from behind the ear or the supraclavicular fossa.

Skin about the face possesses a peculiar reddish tinge that is lacking in the remainder of the body so that defects on the face should be covered by skin donated from some portion of the head above the clavicle, whenever possible.[2]

The loss of a reasonable amount of skin from either eyelid due to a burn, lacerating wound or a tumor may result in ectropion.

Should repair require only skin, the surgeon may choose between direct grafting of the area[8] or an Esser outlay.

In several cases we have employed a professional tattoo artist to impregnate dyes into grafted areas that had not retained the reddish color indigenous to skin about the face.[3] By using local anesthesia during the procedure the latter is quite painless. As occurs following all tattoos, a crust forms for a number of days after which the area heals.

Thus far, though we have found the color to be improved, we have not as yet been able to reproduce an exact color replica as that of the surrounding skin.

Color impregnation may be used in corneal scars that have invaded the area over the iris.[7]

*Derma and Derma-fascia-fat Grafts.* For the filling of defects about the eye derma grafts may be utilized. Experiments have demonstrated that though there is some absorption of the implanted tissue, in many cases it serves as a practical filling material.

To obtain such a graft a split skin graft approximating .008 inches is cut from the donor site. The derma graft is then dissected freely similar to removing a full thickness graft. The donor site may be approximated in a straight line or if its size makes this prohibitive, a split skin graft may be used to cover the defect.

A pocket is created beneath the area of the depression to receive the derma graft. The latter may be inserted in a single layer or turned on itself to gain thickness. Guy sutures to the outside skin from each corner of the graft aid in the maintenance of its position.

Such procedures are often required in conjunction with an eye prosthesis to obtain its acceptance along with cosmetic improvement. (Fig. 5.)

5A 5B

FIG. 5. Dermal graft to the eyelids. A, enucleation occurred in childhood resulting in a recession of the upper and lower lids. B, dermal grafts were inserted within the upper and lower lids to gain cosmetic improvement.

In order to gain greater thickness for an implant the fascia and fat may be included with the derma. The inguinal region presents an excellent donor site. Such a graft has advantages over an ordinary fat graft in that the absorption is generally less.

*Mucous Membrane Grafts.* Conjunctival senecia, usually resulting from burns or injury, may prevent functional movement of the eyeball. Eradication of such a defect necessitates resection of the guilty scar tissue and replacing the areas with smooth lining.

It has been our experience that mucous membrane rather than skin serves best as a donor media in such cases. The absence of the keratin layer and its greater elasticity are advantages of mucous membrane as a conjunctival graft.

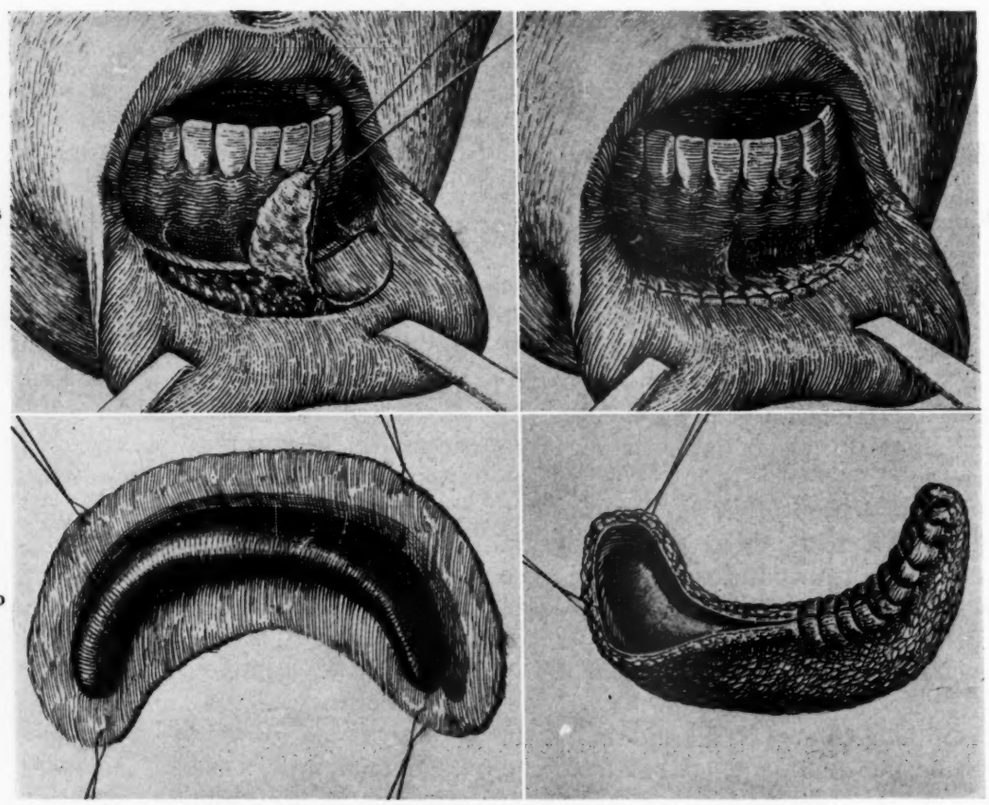
The tissue is easily obtainable within the mouth and is usually taken from the area behind the lower lip. Sufficient tissue is resected for use; the adjacent edges are undermined and approximated with everting mattress sutures. (Figs. 6 and 7.)

A pocket is created sufficiently large to compensate for postoperative contracture. The graft is sewn around dental stent that has been molded to fit the pocket. The mucous membrane is sutured to the skin edges and the latter approximated. Several guy sutures to the outside skin maintain

6A

the position of the graft. The eyelids are sewn together for a period of ten days or longer.

*Eyebrow and Eyelash Grafts.* An eyebrow may be replaced with a direct graft, including the hair follicles, taken from the opposite brow or the scalp. The line for the proposed eyebrow is marked and incised to obtain a shallow trough. The graft is readied from the donor site and sutured into position. Care is observed to accomplish the proper direction of the hair follicles. A dressing is applied with pressure



6B 6C 6D 6E

FIG. 6. Grafting of fornix with mucous membrane from the mouth. A, symblepharon interfering with function of the eyeball may require excision of the scar and introduction of a graft. Either mucous membrane or skin may be employed for grafting. B, depicting the use of lower lip as a donor site for mucous membrane. C, sufficient mucous membrane is easily acquired. The adjacent edges of the donor site are widely undermined to allow for approximation without tension so that no lip deformity occurs. D, dental stent molded to fit the defect created following dissection of the conjunctival scar. E, the mucous membrane is laid over the stent with the raw surface outward and carefully sutured so as to gain a snug fit. The stent covered with mucous membrane is inserted into the pocket. Several sutures are taken to the outside holding the graft in position.

in the same manner used for a full thickness skin graft.

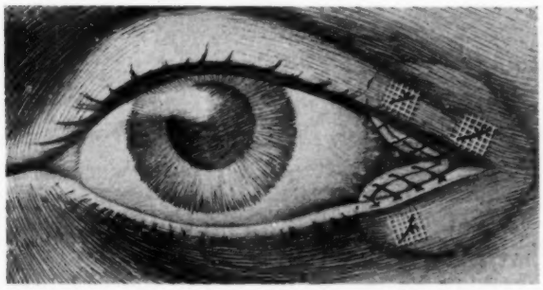


FIG. 6. F, the edges are sewn to the eyelids. The upper and lower eyelids are sewn together. After ten days the stent usually begins to extrude and the graft has taken.

The island graft to include the temporal artery tunneled into position of the eyebrow may be employed where required.

The loss of an upper or lower lid will necessitate the reconstruction of the latter as well as introduction of new eyelashes. Several methods have been suggested for blepharopoiesis and the procedure we usually employ was described by Hughes.[4] In some cases we have successfully used a direct transplant of eyebrow to create lashes.

In cases in which the cheek cannot be pulled upward without too much tension, the introduction of a flap to create a lid may be necessary and a similar procedure to transplant the lashes may be employed.

### MUSCLE OPERATION

It is not the purpose of this article to discuss all the muscle operations performed about the eye. The procedures involved in the correction of ptosis and paralysis are our main interest here.

Many technics have been advanced and the following is the procedure we employ for blepharoptosis of the upper lid. The operation may be carried out through the conjunctival route (Motais and Kirby) or through the skin (Wiener).

The surgeon hopes to gain an elevation of the lid without lag, the normal crease of the skin of the lid, a rolling of the lid over the globe of the eye and movement of the lid in a reasonably normal manner without the aid of the frontalis muscle.

FIG. 7. Mucous membrane graft for symblepharon following burn; mucous membrane from the mouth has been grafted to replace scar tissue in the fornix. Following a burn the patient suffered loss of conjunctival tissue resulting in scar and fixation of the globe to the lateral side. Complete dissection of the scar tissue and grafting of the defect with mucous membrane has resulted in functional improvement.

An incision is made along the everted conjunctiva immediately above the upper border of the tarsus. The conjunctiva is undermined from the muscle following the line of cleavage. A second distal incision parallel to the first is made following the normal curve of the lid. This incision is carried through the orbicularis and meets the previous incision on the lateral side allowing conjunctiva and muscle to be lifted. Appropriate sutures are taken so as to approximate the edges of the muscle and those of the conjunctiva.

In seventh nerve paralysis we have incorporated sections of temporal muscle within the upper and lower lids. In our experience neither muscle or fascia slings to the eyelid body proved too satisfactory a solution to a very difficult problem.

### FASCIA

Fascia may be utilized to fill defects. The fascia laid on itself several times may be inserted within a pocket. We have found that fascia absorbs least next to autogenous cartilage when employed as an implant. When a thicker graft is required, fascia with fat attached may be utilized; however, we are reluctant to employ any fat as a transplant believing that it is broken down and absorbed too readily.

Slings of fascia may be employed to overcome blepharoptosis and sometimes

may be used conjointly with a muscle operation.[5]

### IMPLANTS

*Cartilage.* Cartilage may be used around the eye as a solid-filling material. It may be sculptured in a single piece to fill the defect or diced into small cubes and packed into a pocket. Penn has described a method of grating cartilage on a modified potato masher and storing it in small bags ready for use. We have employed this procedure in a number of cases with satisfactory clinical results.

Autogenous cartilage is usually obtained from the patient's rib or septum. Peer has demonstrated the integrity of autogenous cartilage and has also shown that in the young it continues its growth when transplanted. Generally, it is believed that autogenous cartilage is the material of choice when the latter is required.

Many surgeons have utilized homogenous cartilage for a number of years. It may be obtained from the patient post mortem fixed in either formalin or alcohol, or boiled and refrigerated in merthiolate until required for use.

Homogenous cartilage is easily obtainable and prior to surgery the desired graft may be estimated from measurements made on a plaster cast model taken from the patient. The cartilage may be sculptured and several small holes drilled through and through to allow fibrous tissue to rivet through the implant and fasten it more securely in the desired position.

*Bone.* For the filling of defects, especially over the supra-orbital, infra-orbital or glabellar regions, bone has been employed. Usually, cancellous bone from the anterior iliac crest is used and inserted into a previously created pocket.

A plaster cast model of the whole face is made and the defect patterned in wax. Meticulous study and preparation may be the difference between a fair result and a good one.

To gain the bone an incision is made over the iliac crest. It may be divided into small pieces with a rongeur and inserted into the recipient pocket. When a single piece of bone is used, it may be shaped and smoothed with an electric burr.

Reasonable pressure is applied over the area and allowed to remain a week or ten days.

*Metal and Acrylic.* Tantalum, vitallium® and ticonium are some of the metals that may be used for implantation. They may be employed similarly to cartilage depending upon the site and the specific requirements.

Acrylic molds may be cast from a moulage and utilized to fill defects as required. Their choice will depend upon the discretion of the individual surgeon.

In our experience these materials have not proven as satisfactory for implants about the face as derma grafts, fascia, cartilage or bone.

### PROTHESIS

Bulbulian and Clark have written in detail concerning the procedures for reconstruction with prosthetic appliances within and about the eye. Various technics and materials are applicable dependent upon the extent of tissue loss.

When there has been massive destruction of tissues about the eye and a prosthesis is desirable, it is produced by first casting the defect in plaster and then making a wax pattern from the clay model. Following this, the latter is utilized to construct the latex prosthesis. It is usually held in position on the patient by attaching it onto spectacles.

When a prosthetic eye is required, it may be of glass or plastic material. Reudemann has recently developed a technic whereby the base of the prosthetic eye is permanently attached to the muscles within the orbit allowing the prosthesis to be screwed into a fixed position. This allows for greater movement of the artificial eye.

Often, implanted grafts of fascia, derma or cartilage are required within and about

the eye to overcome crevices and depressions in conjunction with ocular prosthesis.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The value of the cytologic test for malignancy by the examination of vaginal smears was recently proven by a statistical study on a large series of cases. Some 8,000 smears were reviewed on almost 2,000 patients. This test failed to find cancer when it did exist in ten of 124 patients, an error of 8 per cent; on the other hand, false positive diagnosis of malignancy was made on thirty-four of almost 1,600 patients, an error of 2 per cent. Sarcoma of the uterus, chorionepithelioma and even primary adenocarcinoma of the oviduct can be diagnosed by vaginal smears. Some authorities believe that a careful study of these smears enables one to diagnose squamous cell cancer of the cervix earlier than is often possible by a biopsy of the tumor. (*Richard A. Leonardo, M.D.*)

# CARCINOMA OF THE ANUS*

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THE following series of forty-seven patients with anal carcinoma, forty-four of whom were treated with irradiation, showed a relative survival rate of 35.9 per cent.

As a result of this study the following suggestions for uniform classification and treatment are proposed:

*Group I.* In this group are lesions confined to the anal canal, movable and not invading the sphincteric mechanism, 1 to 1.5 cm. in diameter and without clinical evidence of inguinal adenopathy. These can be successfully treated with x-radiation and local excision of the lesion.

*Group II.* Classified in Group II are lesions which have invaded the sphincteric mechanism and are annular and operable. We have treated these lesions during the past five years and propose to continue to treat them using either Miles' abdominoperineal resection or a perineal resection with the creation of an anal colostomy. We prefer the abdominoperineal operation, but in patients who are advanced in years or who have cardiac or renal insufficiency and cannot tolerate this more formidable resection, the perineal resection is the procedure of choice.

*Group III.* In this group are those lesions locally resectable by simple excision but where there is definite clinical evidence of lymphadenopathy in the inguinal area. Excluding the groin, the lesion of the anus is treated with x-radiation and subsequent local excision followed with a superficial or radical groin dissection as indicated by the findings at the time of operation.

*Group IV.* In Group IV are classified those lesions that have invaded the surrounding sphincteric mechanism and the vaginal vault, the ischiorectal space and bony pelvis and where there is fixed inguinal adenopathy or distant metastasis. Here radical surgery is out of the question and palliation in the form of x-radiation is the only treatment that can be offered. When the patient presents an anal carcinoma with groin involvement, the rate of cure will be markedly diminished and any form of treatment may fall short of complete eradication of the disease. We have observed that when patients presented groin involvement, the chances of five-year survivals were diminished by at least 40 per cent over those without such metasteses.

* * * *

Of 1,441 cases of carcinoma of the rectum seen at this Institute during the interval between 1921 and 1943, only forty-seven lesions (3.3 per cent) were epidermoid in character. Twenty of the patients were men and twenty-seven were women. Some type of irradiation was the chief form of treatment in all but one case. Local excision or perineal resection was used for palliation. Radical surgical resections were not utilized here until 1943. Our experience has been sufficient, we believe, to formulate an opinion of value concerning the efficacy of irradiation therapy in the treatment of anal carcinomas.

*Histologic Classification.* Utilizing Broder's classification it was found that in thirteen cases the tumor was Grade I; in thirteen, Grade II; in fifteen, Grade III and in six, Grade IV.

In conformity with Sweet's classification[1] as to size we found in thirty-four cases that the growth was "large." This group included the annular tumors and

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those which had invaded the surrounding tissue. In thirteen cases the growth was classified as "small." In this group were those confined to the anus.

*Involvement of the Inguinal Nodes.* There was metastasis to the lymph nodes of one or both groins in fourteen patients at the time of the initial examination. Twelve patients had large growths and in two the growth was small. The grade of the tumor bore no relationship to the size, invasiveness or degree of inguinal node involvement. The major portion of the cases were classified clinically as advanced. Usually a long interval had elapsed between the onset of symptoms and the medical consultation.

*Age Incidence.* The average age was 60.6 years. The youngest patient was twenty-four years old and the oldest was eighty-five.

*Symptoms.* Bleeding was found to be the predominant and often the only symptom. Occasionally it was associated with hemorrhoids, which caused many of the patients to seek relief. In those instances in which hemorrhoidectomy was done, the pathologist made the diagnosis of anal carcinoma.

*Mode of Treatment.* Of the forty-seven cases observed, two patients were not treated because of the far advanced state of the disease. Forty-five patients were treated as described in Table I.

*Five-year End Results.* Analysis of the five-year end results is given in Table II.

TABLE I
METHODS OF TREATMENT

| Treatment | Grade I | Grade II | Grade III | Grade IV | Total |
|---|---|---|---|---|---|
| HPX* only | 4 | .. | 3 | 1 | 8 |
| HPX and radium pack | 3 | .. | 2 | 1 | 6 |
| HPX and seeds | 3 | 5 | 1 | 1 | 10 |
| HPX, pack and seeds | .. | .. | 1 | .. | 1 |
| HPX, pack and perineal resection | .. | .. | .. | 1 | 1 |
| HPX, pack and coagulation | .. | .. | 1 | .. | 1 |
| HPX and perineal resection | .. | 1 | 1 | .. | 2 |
| HPX, pack, seeds and local excision | 1 | .. | .. | .. | 1 |
| Radium pack only | 1 | 1 | 1 | .. | 3 |
| Radium pack and seeds | .. | 3 | .. | 1 | 4 |
| Radium pack, seeds and perineal resection | .. | .. | 1 | .. | 1 |
| Seeds only | 1 | 2 | 2 | 1 | 6 |
| Local excision only | .. | 1 | .. | .. | 1 |
| No treatment | .. | .. | 2 | .. | 2 |

* High power x-ray.

TABLE II
FIVE-YEAR END RESULTS

| | |
|---|---|
| Total No. Patients | 47 |
| Indeterminate Group | 8 |
| Dead as result of other causes and without recurrence | 5 |
| Lost track of without recurrence | 1 |
| Moribund on admission and no treatment given | 2 |
| Determinate Group | |
| Failures: | |
| Dead after recurrence but not as a result of cancer | 0 |
| Living with recurrence | 0 |
| Dead as result of cancer | 25 |
| Total Failures | 25 |
| Successful Results | |
| No evidence of disease 5 years after treatment | 14 |
| Successful results as per cent of determinate group | 35.9 |

The five-year survival rate of the determinate group is 35.9 per cent; for the entire group it is 29.5 per cent.

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# TECHNIC FOR INSERTION OF METAL STAPLES IN CASES OF EPIPHYSEAL GROWTH ARREST*

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A SIMPLE and effective technic is presented for the accurate placing of staples in cases of temporary epiphyseal growth arrest incorporating the use of a Kirschner wire as a guide.

* * * *

In cases indicating the arrest of epiphyseal growth Blount and Clarke[1] have aptly described the use of stainless steel wire staples. To date staples seem to provide the simplest method for temporary arrest of growth with resumption of normal epiphyseal activity after their removal.

The utilization of metal staples is one of several methods which have been used for the correction of excessive length and angular deformities of the extremities. In 1933 Phemister[6] propounded the idea of terminating epiphyseal growth in cases of unequal leg length. His method of curettement and the reversed bony block creating a bony bridge is well known. Cauterization of the epiphyseal line after curettement was described in 1939 by Wilson and Thompson.[10] White used a rectangular block with 90 degrees rotation in addition to curettement.[9] These methods resulted in permanent growth arrest.

It remained for Haas[3,4] to introduce, in 1945, the principle of temporary arrest of growth by means of a rustless steel wire loop which could be removed after correction was obtained. Thus was established the rationale for the use of the metal staple as advocated by Blount.

Accuracy in placement of the staples is imperative in order that complete growth arrest is obtained. Otherwise, deformities might occur due to asymmetrical growth.[2,7,8] Moreover, if not properly placed the position of the staples might become disrupted, either extruding, bending excessively or breaking.[1]

Review of the literature fails to reveal any technic other than blind insertion of the staples after which, of course, roentgenograms are taken to determine position. We have used a simple and effective technic in the application of metal staples using the Kirschner wire as a guide. Not only does this method expedite the procedure but it insures greater accuracy in placing the staples. We have used the method in arresting the epiphyses of six long bones at Walter Reed General Hospital. These were all cases of disproportionate growth in the lower extremities, either congenital shortening or shortening secondary to poliomyelitis.

The simple, smooth wire staple as described by Blount and Clarke[1] was found satisfactory. The device is a $\frac{3}{32}$ inch rod of stainless steel with the legs $\frac{3}{4}$ inch long and the cross member $\frac{3}{8}$ inch or $\frac{5}{8}$ inch, the wider being used in the femur. In the actual application the legs of the staples should be equidistant from the epiphyseal plate. Three staples are inserted into each side of the epiphysis, thus using a set of six staples. It has been demonstrated that either one or two staples on each side is inadequate.[1] When properly inserted, growth cessation becomes immediate.

## TECHNIC

The patient is given the usual forty-eight- and twenty-four-hour preoperative preparation to the extremity. After the application of a tourniquet to the thigh the knee is given surgical preparation and

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FIG. 1. Guide wire positioned in distal femoral epiphysis; care is taken not to penetrate into epiphyseal plate or knee joint.
FIG. 2. Central staples placed on each side using the Kirschner wire as a guide.
FIG. 3. Three metal staples have been inserted both laterally and medially. The cross member straddles the epiphyseal plate and the legs of the staples are equidistant from the epiphyseal plate.
FIG. 4. Lateral projection is obtained to determine accuracy of staple placement.

draped in the routine manner. It is best to flex the knee 30 to 50 degrees.

Under general anesthesia a medial incision 2 to 3 inches long is made obliquely through the skin and subcutaneous tissues over the epiphysis to be stapled. In case both the distal femoral and proximal tibial epiphyses are to be done separate incisions are recommended. Skin towels are applied and the deep fascial layers then split in the direction of their fibers down to the periosteum. Approaching the femoral epiphysis medially the vastus medialis may be retracted anteriorly, especially with the knee in a flexed position. The medial approach to the tibia necessitates splitting the anterior fibers of the pes anserinus.

Upon exposing the periosteum over the condyle, a thin Kirschner wire is inserted through the epiphysis with its point of exit piercing the skin on the opposite (lateral) side. Care should be taken not to penetrate the epiphyseal plate or the knee joint. A roentgenogram in the anteroposterior and lateral projections is then obtained in order to determine the exact position of the wire. (Fig. 1.) If the position is found satisfactory, the medial staples may be placed, using the wire as a guide. The central staple is inserted first in such a manner that the

cross member straddles the epiphyseal plate. (Fig. 2.) The periosteum and overlying cartilage may be incised to allow sinking the staple flush although this procedure may not be desirable if the staples are to be removed later. Two more staples of the same size are placed on the medial side, being ¼ inch to ½ inch anterior and the same distance posterior to the central staple.

On the lateral side an oblique incision is made in a similar manner using the point of exit of the wire as a guide for centering the incision over the epiphysis. Again with the knee flexed the dorsal expansion of the fascia lata is split longitudinally in the approach to the lateral aspect of the femoral epiphysis. The vastus lateralis may be retracted anteriorly to expose the condyle. The lateral aspect of the tibia is approached just anterior to the head of the fibula. The deep fascia is split longitudinally and the extensor digitorum longus reflected from the fibula and its proximal ligament.

Again determining position from the guide wire the central staple is placed in the condyle. The anterior and posterior staples are inserted as described previously. Accurate check films of the six staples are obtained in both projections. (Figs. 3 and 4.) If necessary, any one of the staples may be easily reinserted or moved. However, this is usually unnecessary if positioning has been determined accurately from the guide wire. It is important to center the staples accurately in the anteroposterior direction to avoid backknee or opposite type deformity. The staple should be aimed toward the center of the bone keeping in mind the sloping contour of the condyle. An ordinary inserter is used to place the staples. A specially prepared, wedge-shaped, curved retractor is useful if a staple need be removed, especially if it has been driven flush. However, a periosteal elevator is usually sufficient to lift out the staple. If the position of the staples is found satisfactory, the guide wire may be removed.

In regard to the fibula the proximal epiphyseal plate may be curetted to terminate growth. This procedure may be undesirable in a young child, in which case temporary growth arrest of the fibula might be attempted with small staples or a wire loop.[3] In one of our cases curettement was the method of choice. Exposure of the proximal epiphysis is obtained by elevating the periosteum, after which at least half of the epiphyseal plate is curetted out. The defect may be filled with a few bone chips from the fibular metaphysis. During this procedure care must be taken to retract and protect the common peroneal nerve.

The wounds are closed in layers after releasing the tourniquet and ligating necessary bleeders. Postoperatively, a "long leg" plaster posterior splint is applied and the extremity thus immobilized until the wounds are well healed and the sutures are removed (usually from ten to fourteen days).

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# ADDITIONAL USES FOR REFRIGERATION IN SURGERY

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REFRIGERATION has been applied at City Hospital, Welfare Island, New York, since 1941. More and more clinical indications for Allen's experimental work have been found. Some of the uses of refrigeration are enumerated and divided into two groups, namely, therapeutic and anesthetic. This paper is written in the hope that it will stimulate the use of refrigeration at other clinics and hospitals where it has been employed only for amputations or not at all. General practitioners will appreciate the results of tissue preservation by means of ice box temperature in the patient's homes.

* * * *

In 1941 surgical application of refrigeration was introduced in City Hospital by the senior author[1,2] based on the experimental and clinical work of Dr. Frederick M. Allen.[3] Since that time many papers[4] have been published on the use of this modality as an anesthetic agent for amputations in debilitated patients. In our opinion not sufficient attention has been focused on the use of refrigeration as a therapeutic and anesthetic agent for minor surgical procedures as well as in certain peripheral vascular states. This paper will deal primarily with the application of refrigeration in the form of ice to the aforementioned conditions.

The theoretical and experimental basis of refrigeration has been adequately described by Allen.[3] It was in 1942, after we had observed the reduction in the morbidity and mortality of amputations performed under refrigeration and especially when an embolic leg with a definite line of demarcation was preserved for six weeks, that the use of hypothermia for patients other than those needing amputations was established. Since that time hundreds of patients in City Hospital have had ice therapy. During the past five years multiple procedures have been tried and, by trial and error, certain indications have been found. Therefore, we are now able to evaluate the use of refrigeration in conditions other than amputation.

## REFRIGERATION AS AN ANESTHETIC AGENT

*Saphenous Vein Ligations.* In 1942 the first saphenous vein ligation under refrigeration anesthesia was tried. Despite the successful use of this agent further work was not carried out because the use of novocain locally in simpler.

*Simple Vein Ligations.* It is possible to do a simple ligation of a peripheral vein after an ice bag has been applied locally to the area for one hour. Again, in this condition novocain locally is simpler and easier to use by those unfamiliar with the ice technic.

*Incision and Drainage of Infections.*[5] One of the most frequent surgical procedures on any active surgical service is the incision and drainage of abscess of the hand, finger, foot and toes. Multiple anesthetic agents have been used. The use of novocain in the form of nerve block is frequently unsuccessful. Its use as a local block at the base of fingers or toes may interfere with the circulation of the part. The use of novocain over the abscessed cavity is not recommended by many authorities because of the possibility of spread of infection to adjacent tissues. A simple and practical method giving excellent anesthesia is to insert the infected part into a container of ice. This method can be used in the office or ward and may eliminate the necessity for the use of operating rooms for minor procedures, a problem

which is important in these times when good nursing personnel is at a premium. Our routine is merely to incase the part in finely cracked ice for thirty to sixty minutes without a tourniquet. The incision is then made and the part may be returned to the ice for relief of pain. In the past year many patients have been treated with this routine without a delay in healing.

*Skin Grafting.* In 1942 we first undertook a split thickness graft using an ice bag for an hour to anesthetize the donor site. Since that time multiple small split thickness and pinch grafts have been taken by this method. The advantage is that a minor skin graft can be performed on the ward, releasing the operating room for major procedures. Skin grafts with this procedure result in as many "takes" as by any other method. This has been confirmed by Mock[6] who learned the technic in our clinic.

*Débridement of Ulcers.* Débridement of ulcers is both practical and simple under ice anesthesia. Ulcers needing débridement can be surrounded with fine ice, and within thirty minutes one may remove necrotic tissue and crust formation without pain. In these cases it is of value not only as an anesthetic agent but also as a therapeutic agent as well.

*Reduction of Fractures.* The reduction of fractures under refrigeration anesthesia has already been described.[7] We wish to stress the practicability of reducing a fracture dislocation of a finger, hand or toe by anesthetizing the local part with ice. The mere packing of the part for thirty to sixty minutes in a can of finely cracked ice is sufficient for the necessary manipulation for reduction.

*Orthopedic Manipulation.* Preliminary work has indicated that manipulative surgery in selected cases of fascial adhesions and uninvolved joint surfaces under refrigeration anesthesia may be a valuable procedure. Under the stimulus of Dr. Charles Murray Gratz of our Orthopedic Section, packing an extremity for two to three and a half hours without a tourniquet has permitted the painless lysis of these adhesions by manipulation after injection of air into the fascial spaces. No untoward complications have arisen.

*Burns.* The use of refrigeration in the treatment of burns has already been described. The only addition at this time is its use in late painful burns of older, debilitated patients. This type of individual is one in whom narcotics may be contraindicated. Refrigeration will relieve the pain, and débridement is possible without additional anesthesia. Débridement is contraindicated in fresh burns since it is grossly impossible to know exactly where dead tissue ends of viable tissues remain. A thorough cleansing of the parts in preparation for grafting may be carried out by irrigations of chilled saline which will painlessly remove most of the charred and dead tissue.

*Painful Surgical Dressings.* Superficial anesthesia to painful sites or for the purpose of changing painful dressings can be created by the application of an ice bag to the area involved for thirty to sixty minutes. We have found this simple method of relieving pain most satisfying in those patients needing frequent painful dressings.

*Miscellaneous Major Procedures.* Several authors have described the use of refrigeration anesthesia for major abdominal and traumatic procedures. Crossman has described how he was able to cut through the layers of a thick abdomen. This procedure is feasible and herniorrhaphies can be done under ice anesthesia. Gratz[7] has described the use not only for the preservation of a badly mangled compound fracture but even as an anesthetic agent for his joint exploration. The use of refrigeration anesthesia in this field is naturally limited and further work is being done.

## REFRIGERATION AS A THERAPEUTIC AGENT

*Burns.* That hypothermia of burned areas results in decreased pain, edema and tissue damage has already been reported by

Allen, Crossman and Safford.[8] Recently Baxter and More[9] in a careful experimental study questioned the clinical reports of the former group. We have treated clinically six patients with second and third degree burns by means of hypothermia. Clinically, there is no doubt in our minds that the application of cold to an early burn will cause a marked decrease in the amount of pain and exhaustion. With the gradual rise in temperature after a period of decreased temperature for ten days, one notes that the slough can be easily removed and islands of epithelium are present. We recommend the use of hypothermia immediately for a period of six to ten days after which the accepted form of treatment for the granulating surface may be instituted.

*Sprains and Strains.* Many athletic coaches are familiar with the use of ice immediately after a severe strain or sprain has occurred. We have found that those patients who are seen soon after they have received their injury will respond with earlier motion and decreased edema if the part is packed in ice for a period of one to two hours. When the part is refrigerated, there is no pain. Motion while refrigerating the part will improve the local condition by actually improving the circulation and the tissue tone.

*Local Use After Surgical Procedures.* Skin temperatures beneath wound dressings or casts can be reduced by the local applications of low temperature either in the form of ice bags or mechanical refrigeration. This is of definite value in orthopedic procedures as is proven by the work of Schaubel.[10] In 345 cases he found that subjectively the patients who have ice applied locally are far better than those who have none applied during the postoperative period. If there is a prolonged low temperature, metabolism is reduced and allowance must be made for a slower healing of the tissues.

*Certain Peripheral Vascular Conditions.* Extremities with adequate circulation when placed in refrigeration for a period of time and then removed to room temperature have a temporary edema which may last for from two to four hours. During this time an improvement is noted in the color of the limb immediately on its removal from ice. The interpretation of these findings suggests a marked peripheral vasodilatation secondary to this change of temperature. Observing a number of patients with ulcers of the extremities it was most gratifying to note granulation tissue soon after refrigeration therapy was started.

Refrigeration as a means of decreasing the metabolism in an extremity whose circulation is impaired or totally obliterated by trauma, such as a compound fracture or by thrombosis of an artery, is physiologically sound. During this time, which may be for weeks, attempts may be made to stimulate circulation by use of antispasmodics and heparin without fear of toxic absorption from the limb which is potentially gangrenous. An extremity so treated because it causes no embarrassment to the host by shock, toxic absorption, pain or spread of infection may be considered as physiologically amputated.

Inevitably, degeneration must occur in a bloodless limb. Collateral circulation may be developed during this period of decreased metabolism when the tissues are at 40° to 60°F. Mock,[11] Ottaway and Foote[12] and Crossman[8] demonstrated how refrigeration serves to gain time in an emergency by preserving the injured part for days or weeks until the patient gains sufficient strength to withstand amputation. One of us (L. W. C.)[13] has described several cases of preservation of phalanges by the use of ice. We have repeated his work in several additional cases in the past year by packing the part in ice and doing a plastic repair at a later time. Another member of the staff (H. D. S.) recalls very vividly the case of a soldier overseas whose leg had been cut extensively by shrapnel who was saved with shock therapy while the limb was packed in ice for a later plastic repair.

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In the treatment of many vague and atypical cases of gastrointestinal disease the best results are likely to follow when surgeon and gastroenterologist work together. Otherwise, often after a normal or "chronically inflamed" appendix or gallbladder has been removed the patient's preoperative symptoms return to plague the operator. Atypical cases merit detailed study *before* operation instead of *after* operation. (*Richard A. Leonardo, M.D.*)

# A NEW UPPER ABDOMINAL INCISION*

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THE author has used the incision described herein in over 200 upper abdominal operations and believes that it is worthy of consideration because it is anatomic and does not sever nerves. Also, it gives much better exposure than the usual transverse incisions, the layers are "staggered" so that a more solid wound is obtained, and it is easily converted into a thoracico-abdominal incision if necessary. Retractors are seldom necessary, thus limiting trauma, and the excellent exposure greatly facilitates the surgery and cuts down operating time.

* * * *

A surgical incision for upper abdominal work should fill certain requisites. These may be briefly outlined as follows: (1) Adequate exposure must be obtained which will allow the surgeon to work with ease. Failure to obtain such exposure prolongs the operation unnecessarily. All of us have seen deaths from shock in operations in

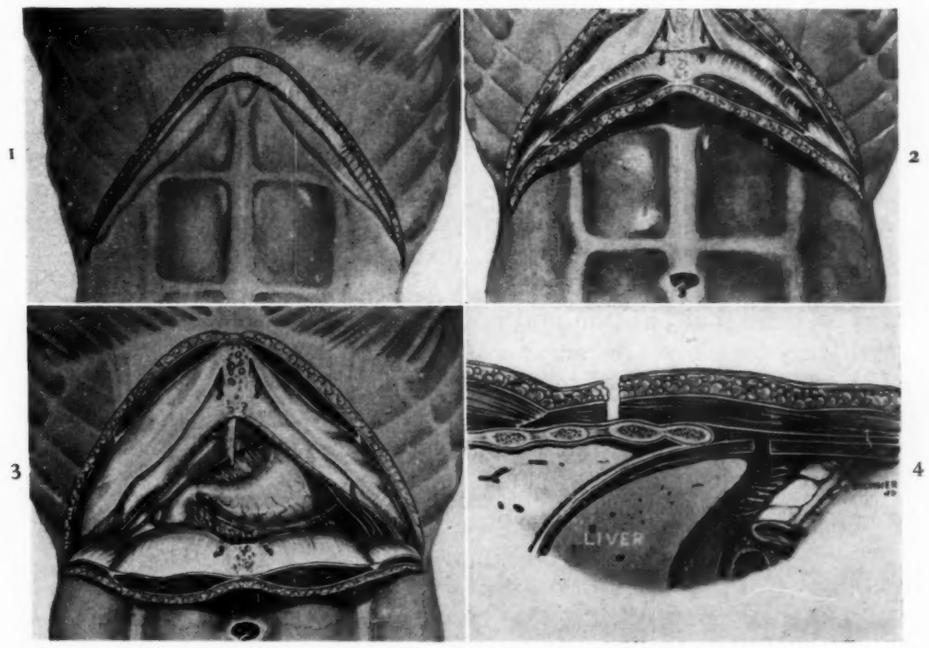


FIG. 1. Shows that the incision is at least 2 inches above the costal margins.
FIG. 2. Shows the rectus and external oblique muscles divided and reflected downward.
FIG. 3. Shows the rectus and external oblique muscles to have been reflected down below the rib margins, carrying with them the eighth intercostal nerve which is not severed; the transversalis has been divided at a point about 1 inch below the costal margins. The wonderful exposure of the abdominal viscera may be clearly seen.
FIG. 4. In suturing the wound it may be seen that the transversalis and peritoneum incision is at a considerable distance below the incision through the rectus muscle. The latter is also shown to be up over the rib margins. This "staggering" effect creates a very strong wound.

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which there was poor exposure, much heavy pulling on retractors and too much time consumed. (2) A minimum of retraction is aimed at since this prevents trauma to the tissues and its resulting shock. To be convinced of this one need only watch the change in respirations, pulse and blood pressure when energetic retraction is begun. (3) An incision should be anatomic and should not destroy too many vital nerves. (4) The incision should be such that it falls together without tension and minimizes the danger of wound disruption. (5) The ideal wound should be such that it may be altered to meet unexpected needs.

The incision which the author believes most nearly meets the aforementioned requirements (Fig. 1) is made well above the costal margins (about 2 inches). This penetrates the rectus and external oblique muscles. The incision with these muscles is retracted downward (with ease) below the costal margins. (Fig. 2.) The eighth nerve readily leaves its subcostal position and is retracted with the muscles. The nerve is not cut. (Fig. 3.) The transversalis and peritoneum are now divided a short distance below the rib edges. The falciform ligament is divided and ligated. The wound automatically falls apart to give excellent exposure. Practically never is a retractor of any kind used. The skin and muscle edges are covered with towels in which rubber tissue or cellophane is folded to give protection.

In sewing up the wound the author sutures the peritoneum and the transversalis muscle as the deep layer. The rectus and external oblique muscles are then brought up over the rib cage and the fascia sutured. It will be seen then (Fig. 4) that the deep layer is sutured a considerable distance below the superficial layer of muscles. In this manner the two incisions are "staggered." This produces an unusually strong wound, particularly since the outer layer of muscles is divided and resutured on the chest. "Jackknifing" the patient assists in the suturing of the external fascia.

This incision is particularly useful for gastric resections and pancreatic surgery. Should a lesion in the cardiac end of the stomach or lower esophagus be unexpectedly found, this incision can readily be converted into a thoracico-abdominal incision.

# Case Reports

## CARDIOSPASM FOLLOWING VAGOTOMY*

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DURING the past several years the literature has been replete with articles on vagotomy in the treatment of peptic ulcer. For the most part the reports have been favorable. Those who have had the greatest experience with this operation are very enthusiastic but they warn against accepting it as the last word in peptic ulcer treatment. As is the case with gastroenterostomy and gastric resection we must wait fifteen, twenty or even more years before we can accurately judge the value of this procedure. Recurrent ulceration, nutritional disturbances, dysfunction of the intestinal motility and absorption, unassociated acute surgical conditions arising in a partially denervated stomach and small bowel, and even malignancy are but a few of the possible late complications which may follow vagotomy. Only time will tell the complete story.

The immediate complications following vagotomy are well known and well reported. The most outstanding of these are gastric atony and pylorospasm with their accompanying epigastric fullness, nausea, vomiting, foul gaseous eructations and diarrhea. These disturbances are usually self-limited and short-lived but occasionally the former has been so severe and protracted that gastroenterostomy has been the only measure affording relief. When such extreme cases occur, one wonders whether or not they are caused by the vagotomy *per se* or whether there might not have been some pre-existing cicatricial pyloric narrowing which was made evident by the diminished gastric motility. Despite such occasional severe complications the majority are not too disabling and are often corrected or improved by the administration of urocholene or some other parasympathicomimetic preparation.

Other less frequent early complications such as perforation of an ulcer have been reported but in the light of our present understanding of this procedure it would not seem justifiable to assume that such an accident is the direct result of vagotomy.

In general, the early complications are the result of sympathetic-parasympathetic imbalance and persist until some compensatory mechanism takes over, be it central in origin or, as is probably the case, intrinsic within the affected organ. Most authorities are agreed that the parasympathetics acting through the vagus have an acceleratory effect on gastric motility and an inhibitory effect on the pylorus and that after vagotomy the sympathetics, acting unopposed, produce gastric atony and pylorospasm. There is not, however, complete agreement as to the roles the two divisions of the autonomic nervous system play in the innervation of the cardia and esophageal musculature. Nevertheless, it would seem reasonable to assume that their action here is similar to that elsewhere in the gastrointestinal tract. White and Smithwick[16] quote no less an authority than Knight as saying that the vagus and splanchnic nerves are antagonistic in influencing the tone of the esophageal musculature and its cardiac sphincter. In this dual mechanism, as in the

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case of the distal end of the stomach, the parasympathetic stimulates and opens the sphincter, whereas the sympathetic causes inhibition of peristalsis and constriction of the sphincter. There is both laboratory and clinical evidence to support this contention. Dragstedt[12] states that intrathoracic section of the vagi in dogs almost uniformly produces cardiospasm or achalasia as well as gastric atony and spasm of the pylorus. In addition, interruption of the sympathetic nerve supply to the cardia has given fairly consistent relief of cardiospasm in the hands of some surgeons. Ivy,[15] speaking of vagotomy, has said, "The procedure has the disadvantage of predisposing to gastric atony and retention as well as to achalasia of the cardiac sphincter."

Contrary to expectations, achalasia or cardiospasm has been a seldom encountered complication following vagotomy. A cursory review of the recent literature reveals that in over 550 cases of vagotomy reported upon no mention was made of achalasia or symptoms which could be attributed to it. However, in fifty patients treated by Grimson and his associates[4] with transthoracic vagotomy for peptic ulcer there were twenty who had temporary difficulty in swallowing following operation. The disturbance was apparently minimal except in one patient who was readmitted two weeks after discharge with complete obstruction which had been present four days. Fluoroscopic examination revealed a narrowing of the lumen of the esophagus extending the full length of the operative site. This subsided spontaneously after several days and there was no residual constriction on repeated examination. On the other hand, Dragstedt[12] in reporting 212 cases of vagotomy states, "It is of great interest that we have not encountered spasm of the cardia in a single patient following vagus section." In the discussions following the presentation of recent papers on vagotomy, a number of surgeons have alluded briefly to dysphagia of a mild and temporary nature occurring in some of their patients in the immediate postoperative period.

Moses[6] in an excellent review article reports a case of achalasia which followed vagotomy. He tells of a man forty-four years of age in whom slight difficulty in swallowing developed on the seventh postoperative day. He was discharged but three days later was readmitted because he was unable to swallow solid food which made him feel he was "choking to death." Fluoroscopy showed the upper three-fourths of the esophagus to be slightly dilated and the lower 5 to 6 cm. did not visualize for four minutes, after which time there was a thin trickle of barium into the stomach. The dysphagia persisted for the next three days after which there was a subsidence of symptoms and normal barium flow following a celiac ganglion block with bromsalizol. The difficulty recurred five days later but subsided somewhat after another bromsalizol block. In another week's time there was no further dysphagia.

To date fifty-seven vagotomies have been performed on the pavilion service of the New York Hospital. In only one of these was dysphagia encountered. The following case is presented because, although an uncommon complication, it is one more bit of information in helping us to evaluate a relatively new procedure.

### CASE REPORT

V. P., a fifty-five year old white male barber, was admitted to the surgical service of the New York Hospital in May, 1947, complaining of epigastric pain and vomiting for two weeks. His illness dated back five years when he began having frequent attacks of severe burning epigastric pain relieved by food and alkali. One year later, after an especially severe attack of pain accompanied by nausea and vomiting, he was admitted to another hospital in which he was told he had gastritis. For the next three years he had only occasional episodes of epigastric pain but no nausea or vomiting. Two years prior to admission he had an attack of pain with nausea and vomiting which subsided after several days' bed rest. A similar attack occurred six weeks before admission and was relieved in a like manner.

Two weeks before his first admission to this hospital his presenting symptoms began. He had burning epigastric pain which radiated through to the back and up to the left shoulder. It was accompanied by anorexia, nausea and vomiting, and was unrelieved by antacids or other medication. There was no hematemesis or melena. There had been a weight loss of 5 pounds in two weeks. The patient stated at that time that he worried easily and smoked a package of cigarettes a day but had taken no alcoholic beverages in five years.

The family history was non-contributory. He had had pneumonia, a fracture of the right elbow and gonococcal urethritis during his youth. Since birth his left eye had been deviated outward but he had no visual disturbances except for occasional diplopia while reading.

Following admission he was placed on a Sippy regimen and rapidly became asymptomatic. A gastrointestinal series showed a defect at the apex of the duodenal cap consistent with the deformity due to ulcer but without evidence of activity. A gastric analysis showed a free-fasting acid of 35 units which rose to a high of 99 units twenty minutes after histamine. At the end of a week he was discharged completely symptom-free.

He remained well for several months but seven months later was readmitted because of the return of his previous symptoms. On examination he presented himself as a well developed and well nourished middle-aged man who appeared to be in good health. His positive physical findings were as follows, namely, lateral deviation of the left eye with fairly normal extra-ocular movements of the globe, partial obstruction of the right nasal passage by a deviated septum, moderate varicose veins of both legs and slight nodularity of the right lobe of the prostate. Examination of the abdomen revealed no abnormality.

Urinalysis and routine blood studies were all within normal limits. Several stools were negative for occult blood. Preoperatively, the insulin tolerance test showed a response of 88 units of free acid and postoperatively a high of 24 units. The twelve-hour gastric secretion, which was 1,050 cc. preoperatively, fell to 550 cc. after operation. A gastrointestinal series revealed antral gastritis and an active duodenal ulcer at the apex of the cap. The esophagus showed normal canalization.

After the usual work-up a subdiaphragmatic vagotomy was performed without technical difficulty. At operation palpation and inspection of the first portion of the duodenum showed thickening, edema and induration consistent with the presence of an active ulcer.

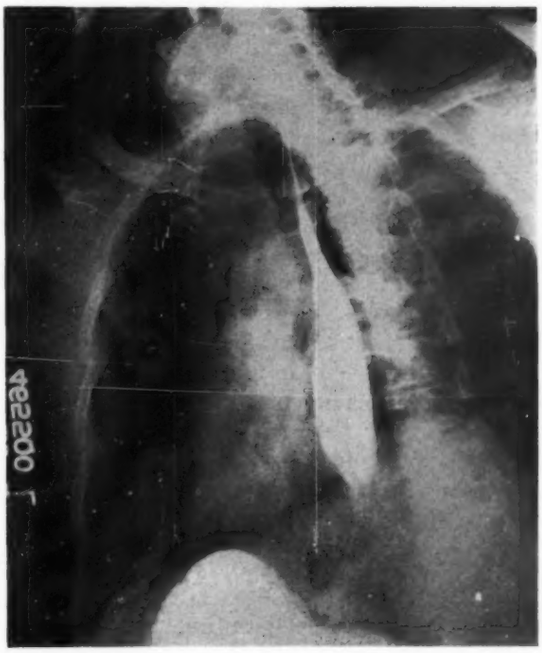

FIG. 1. Esophagogram taken on the fourteenth postoperative day showing the spasm of the lower esophagus and the cardia with proximal dilatation.

For the first five postoperative days constant Wangensteen suction was maintained after which the patient was started on fluids which he tolerated well. By the eighth postoperative day he was given solid food. The following day he refused to eat because the food stuck in his throat and produced pain beneath the sternum. A gastrointestinal series showed dilatation of the upper two-thirds of the esophagus and delay in emptying of the barium into the stomach. The patient's complaints continued. He was returned to a fluid diet and became symptom-free. No specific treatment or medication was given. Two days later he was again given solid food which produced the same difficulties. On the fourteenth postoperative day, six days later, an esophagogram revealed the proximal esophagus to be markedly dilated and the barium column was abruptly interrupted. (Fig. 1.) He was esophagoscoped and narrowing of the lumen of the esophagus was seen at 40 cm. from the upper gum. A bougie was passed through this constriction and after some difficulty the scope could also be passed through the narrowed

portion and into the stomach. The visualized gastric mucosa appeared redder than usual.

On the twentieth postoperative day he was able to take a soft gastric diet with moderate difficulty and at the time of discharge two days later he had only slight dysphagia.

Two weeks following discharge (thirty-six days after operation) he still was occasionally troubled by meat and bread "sticking" in his throat but this difficulty was overcome by his washing the food down with a large amount of water. His appetite was good and he had gained weight. There were no ulcer symptoms and no diarrhea, nausea or vomiting. There was, however, frequent belching and on occasion his stomach would feel "too full."

Fluoroscopy and films of the upper gastrointestinal tract three weeks later, fifty-eight days postoperatively, revealed normal canalization of the esophagus. At that time the patient was without complaint except for continued frequent belching and a feeling of fullness after meals.

## CONCLUSIONS

It is believed that this case of cardiospasm or achalasia following vagotomy is, considering the dual innervation of the gastrointestinal tract, an example of sympathetic-parasympathetic imbalance. Although it is conceivable that edema incident to the trauma of the operation may produce dysphagia, as suggested by Dragstedt,[12] it would seem a remote possibility in this case in which symptoms persisted for thirty-six days and in the cases reported by Grimson[4] and Moses[6] in which the dysphagia was also of a longer duration than could be explained by local irritation or edema. It seems reasonable to conclude that the only explanation for such cases of esophago- and cardiospasm is that they are the direct outcome of the sectioning of the vagi which in turn results in an unopposed sympathetic stimulation of the affected areas. As with the other complications of vagotomy such as epigastric fullness, nausea, vomiting and diarrhea, cardiospasm also would seem to be self-limited. Why the disturbance should subside spontaneously and be of such a relatively short duration, knowing that regeneration of the nerves in so short a time is out of the question, is a matter of conjecture. One must conclude that as with the return of normal gastric tone following vagotomy an intrinsic and autonomic nervous mechanism within the gut itself takes over in returning the organ to normal function.

It is difficult to explain why, if such cases of cardiospasm are due merely to the sectioning of the vagi, we do not encounter this complication more frequently. Although Grimson[4] reports twenty cases of dysphagia in a series of fifty vagotomies, there was only one in which the symptoms were severe and protracted and in which there was roentgenologic evidence of cardiospasm. It is doubtful whether such mild cases of dysphagia are actually due to cardiospasm. The possibility exists that, unless sought for, many cases of dysphagia might be overlooked but it is unlikely that a true case of cardiospasm would be missed.

## SUMMARY

Considering the dual innervation of the lower esophagus and cardiac end of the stomach, cardiospasm or achalasia might be expected to be a frequent complication of vagotomy.

A review of the recent literature dealing with vagotomy indicates that this complication is seldom seen or reported.

A case of cardiospasm following vagotomy in which the symptoms persisted for thirty-six days is reported.

This complication would seem to be the result of an imbalance of sympathetic-parasympathetic innervation and not the result of local edema or irritation secondary to the operative procedure.

As with the majority of other postvagotomy complications, it is self-limited.

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Occasionally splenectomy is done for certain patients with so-called Banti's disease, yet the operation is not followed with beneficial results. Often the enlarged spleen is due to other causes which can be ascertained by careful study, and it will then be discovered that the patient does not require splenectomy at all. Also, splenectomy is inadvisable in patients with severe cirrhosis of the liver. This operation is very helpful for thrombosis of the splenic vein, cryptogenic splenic enlargement when the liver is normal, hemolytic jaundice, ruptured spleen, an excessively large spleen (as postmalarial) and chronic essential thrombopenia. (*Richard A. Leonardo, M.D.*)

# OBSTRUCTION OF THE DUODENUM BY AN ANEURYSM OF THE ABDOMINAL AORTA*

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ARTERIOSCLEROTIC aneurysms of the abdominal aorta are not common and when they do occur usually arise at a point lower than the origin of the renal arteries.[1] The occurrence of such an aneurysm high enough on the abdominal aorta to obstruct the fixed retroperitoneal duodenum is rare. Bockus[2] presents a comprehensive documentation of the extraduodenal diseases leading to obstruction in the duodenojejunal region and lists aneurysm of the abdominal aorta as another exceedingly rare cause for duodenal obstruction and dilatation.

FIG. 1. Preoperative roentgenogram showing partial blockage and flattening of third portion of duodenum.

Gastrointestinal complaints of any nature are not usually a part of the symptom complex of abdominal aneurysm. Nixon[3] has compiled a large series of aneurysms of the abdominal aorta. He reports 6,974 necropsies at the British Royal Infirmary from 1854 to 1911 among which thirteen aneurysms of the abdominal aorta were found. Eliason and McNamee[4] reported twenty-four cases of aneurysm of the abdominal aorta in 200,000 admissions to the Philadelphia General Hospital from 1930 to 1940. Of these twenty-four cases only two had gastrointestinal complaints, one vomiting and one hemorrhage. Nixon[3] collected 253 cases of such aneurysms and in only six cases was vomiting a presenting complaint. Kampmeier[5] reported seventy-three cases of abdominal aorta aneurysms which were largely syphilitic in origin. Seven of these patients complained of vomiting.

In 1907 Spisharny[6] reported a case of obstruction of the duodenum near the ligament of Treitz by an aneurysm of the abdominal aorta. The patient was admitted emaciated and with considerable pain. In the epigastrium a tender pulsating mass existed over which a bruit could be heard. The patient was operated upon and a posterior gastrojejunostomy carried out to by-pass the obstruction. The patient did well but subsequently signs of severe hemorrhage developed and the patient died. At postmortem examination the bleeding was found to have arisen in the gastrointestinal tract but the exact site could not be determined.

Washburn and Wilbur[7] presented a second such case in 1936. The patient gave a four-year history of intermittent vomiting. He, too, had a large, pulsating, epigastric mass over which there was a faint bruit. X-rays showed dilatation of the second portion of the duodenum due to extrinsic pressure on the third portion. At operation an aneurysm of the abdominal aorta 7.5

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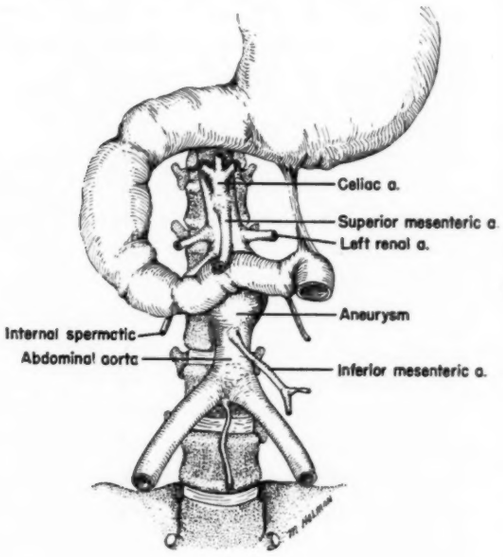
cm. in diameter was found to be the cause of the obstruction. In this case a posterior gastrojejunostomy was performed. In his comment on this paper Walters, who performed the surgery, states that he would have preferred doing a duodenojejunostomy. He chose the former procedure because he believed that the aneurysm was so large that it might interfere with healing at the anastomotic line in a duodenojejunostomy.

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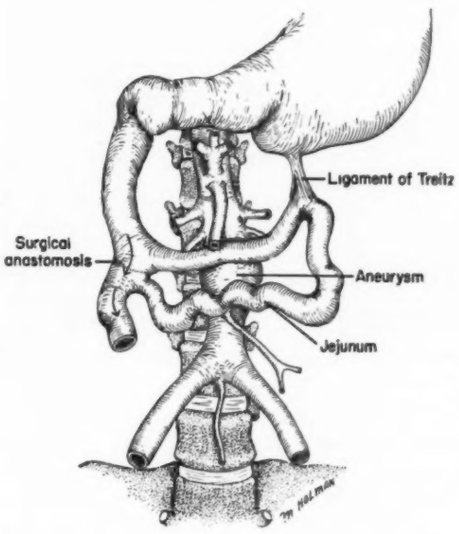


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FIG. 2. Location of aneurysm at surgery; relationship of aneurysm to branches of abdominal aorta and duodenum illustrated.
FIG. 3. Appearance following formation of duodenojejunostomy.

Cases of duodenal obstruction produced by an aneurysm may be observed occasionally but reports of only two such cases have been found in the literature. Certainly, this diagnosis should be considered in all cases of obstruction of the third portion of the duodenum; the diagnosis should be made if a pulsating mass and bruit accompany the obstruction.

## CASE REPORT

The case presented is that of a seventy-six year old male who had been seen at the Cleveland Clinic intermittently since 1927. He was treated first for ureteral calculi and later for arteriosclerotic heart disease. He had never presented any gastrointestinal complaints until August, 1947, when he was admitted because of a retention-type vomiting of three days' duration. There had been no sensation of nausea and no pain. X-ray examinations revealed a normal stomach and duodenum and at least one gallstone. The response to symptomatic treatment was satisfactory. The next report on the status of the gastrointestinal tract was six months later, in March of 1948, when the patient reported for a cardiac check-up and stated that he had been completely free of his previous gastrointestinal complaints.

In December of 1948 persistent and increasing vomiting ensued and in January, 1949, the patient was admitted to the hospital because of these complaints. Pain was still not present but now nausea occurred prior to vomiting. There had been a weight loss of 50 pounds in the three months preceding admission. Physical examination disclosed nothing abnormal except for dehydration. The liver could be palpated 1 cm. below the right costal margin but no other palpable masses were present. The abdominal aorta seemed no more easily palpable than in any thin patient with a moderate degree of lordosis. No bruit was heard when the peristalsis was ausculated.

All laboratory studies were within normal limits. The blood serology tests were negative. By x-ray examination the second and third portions of the duodenum were dilated and

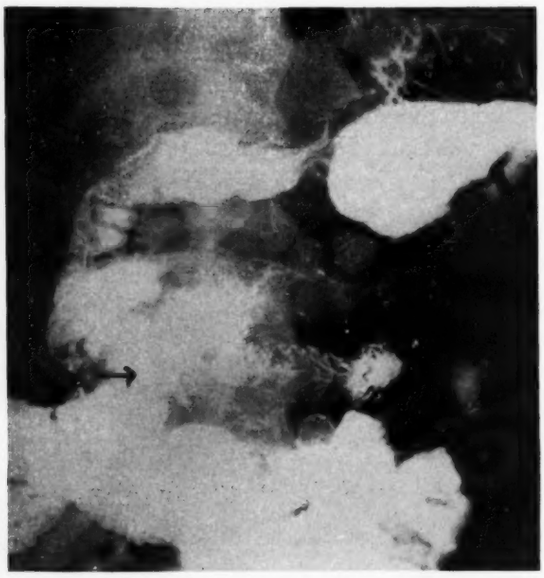

FIG. 4. Roentgenogram seven days postoperatively showing functioning duodenojejunostomy and relief of duodenal obstruction.

there was a narrowed segment in the third portion of the duodenum through which barium passed slowly. This segment was 5 to 6 cm. in length and the mucosal pattern of it was not destroyed. (Fig. 1.)

On February 4, 1949, the patient was operated upon through an upper midline incision. Dilatation of the duodenum and stomach was readily apparent. The jejunum just distal to the ligament of Trietz was collapsed but otherwise normal. Further examination revealed a fusiform aneurysm of the abdominal aorta which measured 5 cm. in diameter and 7 cm. in length. It was situated in such a way as to compress the retroperitoneal and fixed portion of the duodenum and arose just proximal to the origin of the inferior mesenteric artery. (Fig. 2.) An isoperistaltic duodenojejunostomy was then carried out between the duodenum at the juncture of its second and third portions and the jejunum 15 cm. from the ligament of Treitz. (Fig. 3.) The anastomosis was then placed retroperitoneally by suturing the previously made rent in the parietal peritoneum to the jejunum just distal to the anastomosis.

The patient had no untoward effects from the operative procedure. He was allowed out of bed on the day following surgery and was discharged from the hospital on the eighth postoperative day.

X-ray examination prior to discharge showed a satisfactorily functioning duodenojejunostomy and no evidence of gastric retention. (Fig. 4.) A review of scout films of the abdomen taken prior to surgery gave no evidence of an abdominal aneurysm, e.g., calcification or bone erosion.

One month after surgery the patient had gained 5 pounds and seemed to be gaining in strength. He had no symptoms of nausea, vomiting or abdominal pain.

## SUMMARY

A brief review of two previously reported cases of patients with duodenal obstruction by arteriosclerotic aneurysms of the abdominal aorta has been presented. A third such patient who was studied and operated upon at the Cleveland Clinic has been reported.

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# MULTIPLE PRIMARY CARCINOMA OF THE COLON AND OVARY*

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THE occurrence of multiple neoplasms in the same individual is not exceedingly rare. It has been estimated that in about 5 per cent of people with one malignant lesion a second unrelated primary tumor will develop.[5,6] As Slaughter[5] points out the over-all cure rate of cancer is not more than 15 per cent and relatively few patients survive long enough for a second primary tumor to develop; otherwise the incidence might be even higher. The frequency of multiple lesions in cancer patients is far greater than can be explained on the basis of chance and this lends support to the concept that there is such a thing as a tumor diathesis in the individual. Warren and Ehrenreich[7] point out that the predisposition to a second primary lesion in cancer patients is eleven times greater than in the general population.

When Billroth[1] first described multiple primary tumors in 1879, he laid down three postulates for their recognition, namely, that each tumor must have a distinctive histology; that they must arise in different situations within the body and that each must give rise to its own metastases. These criteria can rarely be fulfilled and it is now generally agreed that a multicentric origin may be established if the gross and microscopic picture in each case is characteristic of tumors of that organ involved and if the possibility of metastasis can be ruled out.

There have been several excellent reviews of the subject, the most valuable being those of Warren and Gates,[8] Stalker, Phillips and Pemberton,[6] and Slaughter.[5] The latter has listed the sites of 1,868 multiple neoplasms collected from the literature including forty cases of his own. In this group the most common site of multiple primary tumors was found to be in a single organ, particularly the skin. This was followed in frequency by paired organs, organs of a single system and finally, unrelated organs.

TABLE 1
MULTIPLE MALIGNANCIES IN AUTOPSIES 1937 TO 1946

| Year | No. of Cases | Sites of Tumors |
|---|---|---|
| 1937 | 0 | |
| 1938 | 0 | |
| 1939 | 2 | Liver and seminal vesicles |
| | | Prostate and stomach |
| 1940 | 3 | Sigmoid and rectum |
| | | Glioblastoma multiforma and astrocytoma |
| | | Sigmoid and descending colon |
| 1941 | 3 | Breast and liver |
| | | Bladder and prostate |
| | | Mouth and bronchus |
| 1942 | 3 | Bladder and malignant melanoma |
| | | Prostate and bronchus |
| | | Mouth and bronchus |
| 1943 | 1 | Bladder and colon |
| 1944 | 15 | Cervix and larynx |
| | | Cervix and breast |
| | | Lung and liver |
| | | Esophagus, liver and prostate |
| | | Liver and prostate |
| | | Ampulla of Vater and bronchus |
| | | Bronchus and larynx |
| | | Rectum and skin |
| | | Tonsil and prostate |
| | | Sigmoid and multiple myeloma |
| | | Breast and stomach |
| | | Gallbladder and cervix |
| | | Liver and seminal vesicles |
| | | Mouth and prostate |
| | | Stomach and prostate |
| 1945 | 2 | Sigmoid and transverse colon |
| | | Prostate and stomach |
| 1946 | 0 | |
| Total | 29 | |

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1A

1B

FIG. 1. Case 1. A; section showing adenocarcinoma of transverse colon penetrating deeply into the muscularis. (Hematoxylin and eosin × 16.) B; section of papilliferous cystadenocarcinoma (serous) of ovary; note the invasion of the stroma. (Hematoxylin and eosin × 123.)

Multiple primary tumors of the colon and ovary are relatively uncommon. Slaughter[5] lists nine cases up to 1944 and a search of the literature subsequent to that date fails to reveal any additional cases. The experience at the Institute of Pathology, McGill University, confirms this. In the ten-year period from 1937 to 1946 there were twenty-nine instances of multiple primary neoplasms in routine autopsies. The organs involved are listed in Table 1. In this group there were no coincident tumors of the colon and ovary. However, in the past few months we have had the opportunity of studying three patients all of whom presented a similar clinical and pathologic picture.

## CASE REPORTS

CASE 1. L. G., a forty-eight year old woman, was admitted to the Royal Victoria Hospital on April 7, 1948, with a history of crampy abdominal pain associated with vomiting for three weeks. X-ray examination of the abdomen revealed evidence of a partial large bowel obstruction which at operation was found to be due to carcinoma of the transverse colon 4 inches proximal to the splenic flexure. A colectomy with primary anastomosis was carried out.

The pathologic report revealed that the specimen consisted of a 12 cm. segment of transverse colon to which were attached the greater omentum and transverse mesocolon, the latter being purplish blue in color. Five centimeters from the distal end the bowel was encircled by a stenosing annular mass of rubbery hard tissue which almost completely obliterated the lumen. The tumor extended throughout the wall of the bowel. Regional lymph nodes showed gross tumor involvement.

Microscopic examination revealed that sections of transverse colon showed the normal mucosa abruptly replaced by neoplastic epithelium forming numerous glandular acini varying in size, shape and appearance. The individual cells were tall columnar with basally placed, oval, highly vasicular nuclei. Mitotic figures occurred with moderate frequency. Of the lymph nodes examined two showed tumor involvement; one of these was from the omentum and the other from the mesocolon.

Anatomically, adenocarcinoma of the transverse colon was found, with metastases to regional lymph nodes. (Fig. 1A.)

The patient was readmitted November 8, 1948, because of a gradually increasing mass in the lower abdomen. This was believed to be ovarian in origin. A laparotomy was performed and a large cystic mass replacing the right ovary was found which was removed.

The pathologic report showed that the specimen consisted of a cystic, multiloculated tissue mass weighing 205.0 gm. and measuring 12.0 by 9.0 by 4.0 cm. in the collapsed state. The cyst had been previously opened. The multiloculated cysts contained clear, straw-colored fluid and were lined with a smooth, glistening, grey-pink tissue which in some zones showed fine, soft, friable papillae.

Microscopic examination revealed that a number of sections of the ovarian cyst showed

glandular strands and aggregations of well differentiated columnar neoplastic cells supported by a loose, fibrous stroma. The neoplastic cells were dark-staining basophilic and possessed prominent nuclei with well defined nucleoli. Mitotic figures were plentiful. A number of other zones showed well defined cystic cavities lined with low, columnar, ciliated epithelium with basal nuclei. These zones were sparse in the sections examined.

Anatomically papilliferous serous cystadenocarcinoma of the ovary was found. (Fig. 1B.)

CASE II. C. S., a female aged fifty-three, was first admitted to the Royal Victoria Hospital on May 25, 1948, with a history of constipation, nausea and vomiting of one week's duration. X-ray examination revealed evidence of an obstructing lesion of the sigmoid colon. On May 25th a preliminary cecostomy was performed followed three weeks later by a resection of large bowel and lateral anastomosis.

The pathologic report showed that the specimen consisted of a short segment of large bowel measuring 8 cm. in length. The specimen had been previously opened to reveal a large, annular, constricting and fungating mass which approached very close to one edge of the bowel segment in the longitudinal axis. The tumor was roughly circular in outline.

Microscopic examination revealed that sections showed normal bowel mucosa replaced fairly abruptly with neoplastic epithelium which formed atypical glandular acini in large numbers. Superficially, the tumor was papillary in structure and the epithelial lining of the acini was tall columnar and in many places was fairly well differentiated. The nuclei were dark and hyperchromatic and tended to retain their basal position. The tumor extended widely through the muscularis to reach the surrounding tissue. The tumor showed less differentiation here and the acini were widely distended by the accumulation of pale, stringy strands of mucus. Isolated small foci of cancer cells were present in the surrounding adipose tissue consisting of pools of mucoid material in which small segments of tall columnar neoplastic cells floated. Several regional lymph nodes contained neoplastic deposits.

Anatomically, adenocarcinoma of the sigmoid was found showing mucoid degeneration, with metastases to regional lymph nodes. (Fig. 2A.)

The patient was readmitted November 18, 1948, because of gradually increasing abdominal swelling of four and a half months' duration. There was also a persistent fecal fistula at the site of the previous cecostomy. A large, firm, tender mass was found arising out of the right pelvis. Laparotomy was carried out and a huge pseudomucinous cystadenoma of the right ovary was found. This was multiloculated and adherent to many loops of bowel. It was removed piecemeal and with difficulty. (Fig. 3.)

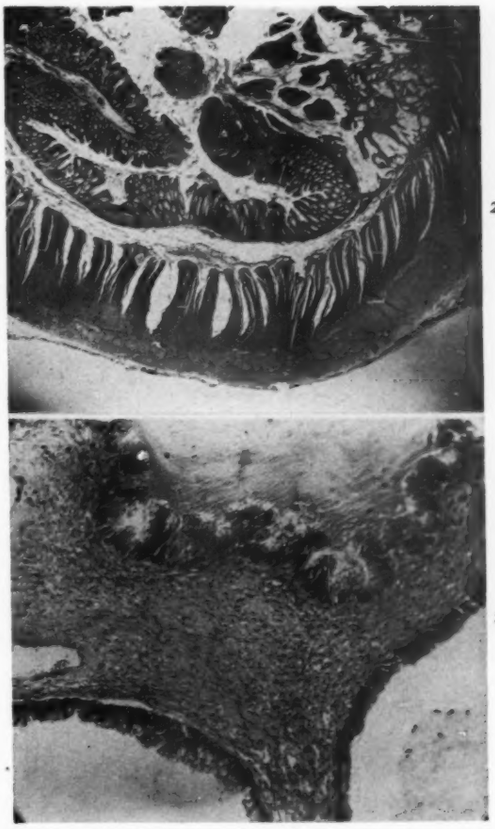


FIG. 2. Case II. A; section of adenocarcinoma of sigmoid. (Hematoxylin and eosin × 16.) B; section of pseudomucinous cystadenocarcinoma of ovary. (Hematoxylin and eosin × 205.)

The pathologic report revealed that the specimen consisted of a number of multiloculated gross fragments of friable mucinous cystic tissue which could not be oriented anatomically. The masses aggregated 875 gm. in weight and a large grapefruit in size. More detailed examination of a number of fragments revealed a mucoid, translucent, fibrous tissue wall studded with thin-walled cystic cavities.

Microscopic examination showed the tissue to consist of numerous closely spaced, slightly irregular cysts lying in a relatively scanty,

FIG. 3. Case II. Barium enema showing displacement of colon by ovarian tumor mass.

cellular, fibrous stroma. The cysts were lined with a single layer of columnar epithelium the cells of which contained darkly eosinophilic cytoplasm, with large hyperchromatic nuclei occupying the lower half of the cell. The peripheral portions of the cytoplasm contained mucous goblets of varying size but for the most part these were relatively small and inconspicuous. Occasionally the lining exhibited short papillary ingrowths. The cysts themselves were filled with pale-staining, stringy, mucoid material.

Anatomically, pseudomucinous cystadenoma malignum of the ovary was found. (Fig. 2B.)

CASE III. A. K., a female aged seventy-six, was first admitted to the Royal Victoria Hospital on July 19, 1948. The patient first noted crampy, right-sided abdominal pain in March, 1948. Following x-ray examination at another center the patient was referred to us with a diagnosis of carcinoma of the transverse colon. A laparotomy was carried out on July 24th and a right hemicolectomy and ileotransverse colostomy were performed.

The pathologic report showed that the specimen consisted of a segment of large bowel 45 cm. long representing the cecum, ascending colon and proximal transverse colon. There were abundant appendices epiploicae and a larger omental mass measuring 23 by 8 cm. intimately attached to the cecal region. The specimen had been opened. Six centimeters from its proximal end there was a rubbery hard, rosette-shaped, slightly elevated lesion which infiltrated all thicknesses of the bowel wall. A second lesion 20 cm. from the first in the vicinity of the hepatic flexure was noted. It consisted of an annular tumor 2 cm. in width encompassing the lumen of the bowel, producing almost complete occlusion. The overlying mucosa was flattened, distorted and ulcerated. Section revealed that tumor tissue infiltrated all coats of the bowel; there was no gross evidence of invasion of pericolic fat. Section of the second described tumor revealed invasion of all costs of the bowel and pericolic fat by tumor. Six lymph nodes were identified in the adjacent fat, none exhibiting gross evidence of tumor.

Microscopic examination showed that sections of both lesions of the bowel were essentially similar in appearance. The normal mucosa was abruptly replaced by neoplastic epithelium forming distorted larger and smaller acini. In both cases the tumor extended through the entire thickness of the muscle coat. The type cell in both cases is tall and columnar with large, vesicular, hyperchromatic nuclei. Mitotic figures are fairly common. One of the six lymph nodes taken for section is completely replaced by tumor and another shows tumor in the pericapsular lymphatics.

Anatomically adenocarcinomas of the cecum and transverse colon were found with metastases to regional lymph nodes. (Fig. 4A.)

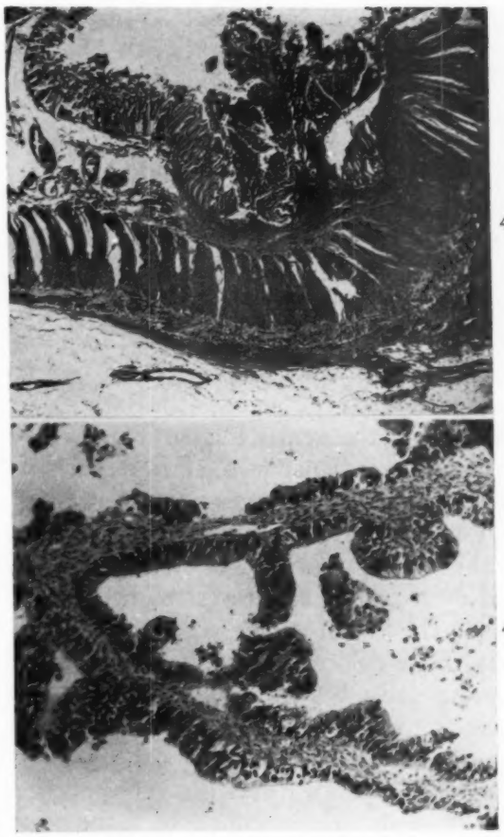
The patient was admitted for the second time on December, 29, 1948. She had enjoyed good health for two months. On October 20th she noted a scanty bloody vaginal discharge accompanied with some soreness of her breasts. Shortly thereafter she complained of dull abdominal pain in the lower left quadrant. In January, 1949, she was readmitted because of a rapidly enlarging pelvic tumor mass believed to be ovarian in origin. She was transferred to the department of gynecology and a laparotomy was performed. A large tumor mass was noted arising from the right ovary and extending to the umbilicus. The tumor exhibited a number of cysts which were filled with a serosanguineous fluid. The growth was removed and a right and left salpingo-oophorectomy was performed.

The pathologic report revealed that the

specimen consisted of a mass of friable, necrotic tissue which was removed piecemeal from the pelvis and abdomen.

Microscopic examination revealed the sections consisted of a mass of glandular and necrotic tissue. The necrosis was widespread; the glands varied in size and shape and appeared to blend with the ovarian stroma. The cells were multinucleated and marked hyperchromatosis and numerous mitotic figures were noted. The tumor was well circumscribed and contained multiple cysts filled with clear, serous fluid. Clinical and gross evidence was in favor of a primary ovarian tumor.

Anatomically serous cystadenocarcinoma of the right ovary was found. (Fig. 4B.)



4A

4B

FIG. 4. Case III. A; section of adenocarcinoma of cecum. (Hematoxylin and eosin × 18.) B; section of serous cystadenocarcinoma of ovary. (Hematoxylin and eosin × 205.)

### COMMENT

It is of interest that in all these cases the clinical picture was identical. Each patient complained initially of bowel symptoms and carcinoma of the colon was discovered and successfully resected. In two of the cases the pelvis was examined at operation and no abnormality was found. In the third there is no note of the pelvic findings in the operative record but the surgeon is certain that no gross pathologic lesion existed.

Each patient made a good recovery from the initial operation and then, after a varying period, was readmitted because of a large pelvic mass. The time interval in these cases was eight, six and three months, respectively. The mass in each instance was believed to be ovarian in origin and, clinically, recurrence of the primary tumor was suspected. At the second operation there was no evidence of recurrence of the bowel carcinoma in any case.

In considering multiple tumors of the bowel and ovary three possibilities are present, namely, the bowel tumor is secondary to the ovarian growth; the ovarian tumor represents a metastatic lesion with the primary in the colon and the two tumors are primary growths of separate origin.

The first possibility is easily dismissed in all these cases. At the initial operation there was no evidence of ovarian tumor and the bowel lesions were typical annular ulcerating growths which on section proved to be adenocarcinomas. They were all of polypoid type, with the exception of the cecal carcinoma in Case III, and appeared to represent malignant transformation of an adenomatous papilloma. Microscopically, all of these tumors exhibit a papillary arrangement of the neoplastic cells at the edge of the growth. They all contained mucin. Secondary tumors of the colon are generally infiltrating growths which penetrate all coats of the bowel and produce superficial mucosal ulceration.

The second possibility must be carefully considered. Willis[9] states, "Ovarian metastases occur in about 5 per cent of fatal cases of large bowel carcinoma and they have often simulated primary ovarian disease." Ovarian metastases in colonic

growths occur by direct contiguity or transperitoneal implantation. They are usually bilateral and solid and may show Krukenberg stigmas, i.e., mucoid epithelial changes, signet-ring cells, sarcomatous stromal changes and the presence of mucin. The cells are usually recognizable as of intestinal origin and do not show cilia or other distinctly ovarian characteristics. Secondary tumors of the ovary tend to occur in young individuals. Willis[9] points out that the functionally active ovary is more liable to metastases and secondaries are rare in the senile ovary. The cases reported in this paper were all in females past the menopause, the ages being forty-eight, fifty-three and seventy-six years. In all instances the ovarian tumor was unilateral and cystic. It is of interest to note that in Case I the bowel tumor occurred in the left half of the colon (splenic flexure) while the ovarian growth was in the right ovary. In Case II the colonic carcinoma was in the sigmoid and again the right ovary was involved. In Case III both tumors occurred on the right side, cecum and right ovary.

The microscopic picture of the ovarian tumors in all cases was suggestive of primary ovarian carcinoma. In Case I the cells were ciliated cuboidal to columnar and in many areas the picture was that of a benign serous cystadenoma. No mucin was found with special stains. In Case II many areas showed cylindrical cells with basal nuclei arranged in palisade fashion characteristic of a pseudomucinous cystadenoma. In Case III the microscopic picture was that of a cystic adenocarcinoma with no areas of cells which were definitely of ovarian origin. However, the clinical evidence, gross cystic appearance and serous fluid content (mucicarmine stain negative) all favor a primary ovarian neoplasm.

In all cases the ovarian tumor was the only pathologic finding at the second operation. There was no evidence of lymph node metastases and no peritoneal implants. The contralateral ovary showed no evidence of tumor growth.

Because of the aforementioned findings it is believed that the ovarian tumors in these patients represent primary growths rather than secondary deposits from the bowel carcinoma.

## SUMMARY AND CONCLUSIONS

1. Three cases of patients with multiple primary carcinoma of the colon and ovary are reported.

2. The clinical picture was similar in all, namely, the appearances of a pelvic mass following the successful resection of a primary bowel tumor.

3. In each case the multicentric origin of the tumors is apparently established by the pathologic picture and the exclusion of metastases from the original lesion.

*Acknowledgment:* We would like to express our thanks to Drs. G. G. Miller, J. C. Armour and A. L. Wilkie for permission to report these cases and to Dr. T. R. Waugh for his constructive criticism and interest in the preparation of this paper.

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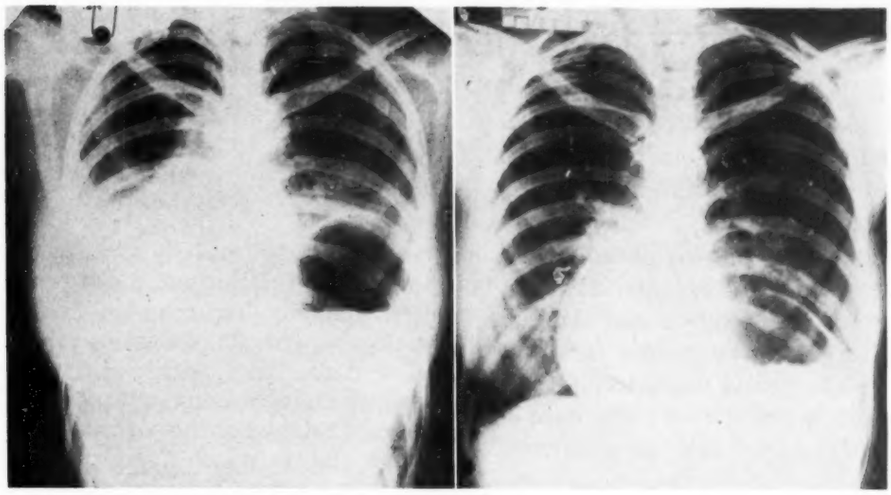
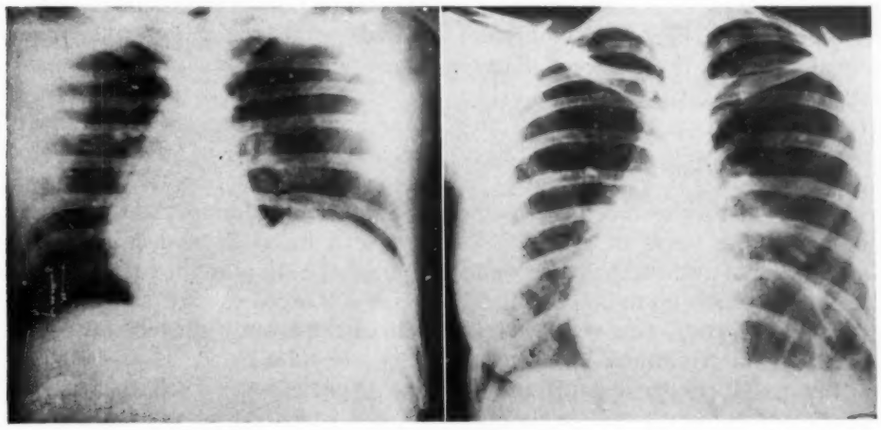


1 2

FIG. 1. X-ray of chest after first pregnancy taken in complete expiration and showing a congenital eventration of the diaphragm with the heart displaced toward the right side.
FIG. 2. X-ray of the chest following first pregnancy in deep inspiration showing compression of the right lower lobe.



3 4

FIG. 3. X-ray of the chest during labor of the second pregnancy showing no essential change from previous films.
FIG. 4. X-ray of the chest following second pregnancy showing no change from previously reported films.

estimated at December 19, 1948. At that time the urine was negative, the leukocyte count was 8,600 per cubic millimeter, 53 per cent polymorphonuclears, 26 per cent lymphocytes, 10 per cent band forms and 11 per cent eosinophyles. The hemoglobin was 100 per cent (Sahli 14.5) and erythrocytes 4,500,000. The Kahn test was negative and the sedimentation rate was 10 mm. the first hour. The sputum was negative for blood and tubercle bacilli. The Vollmer patch was negative and the Aschheim-Zondek test (Friedman modification) was positive.

The hemoptysis did not recur and the fatigue and weakness were relieved by large doses of Vitamin B Complex with ¼ gr. phenobarbital before meals. On October 18, 1948, the patient complained of dyspnea with palpitation on effort. Her vital capacity was 1,844 cc., hemoglobin 82 per cent and pulse rate 120. She was advised to get more rest and to avoid effort. On November 29, 1948, the vital capacity was 2,800 cc. and pulse rate 110; the dyspnea no longer bothered her.

On December 18, 1948, labor started spontaneously at 5:00 A.M. and proceeded rapidly. At 7:15 A.M. the patient complained of a sudden warm feeling at which time the blood pressure

# EVENTRATION OF THE DIAPHRAGM ASSOCIATED WITH PREGNANCY

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THE condition known as eventration of the diaphragm is relatively rare; a review of the English and American literature has failed to reveal more than two cases[1,2] associated with pregnancy. It is with this in mind that a third case successfully undergoing two pregnancies is hereby added.

## CASE REPORT

Mrs. E. McC., a twenty-four year old white housewife, gravida 1, para 0, was first seen July 10, 1946, at St. Barnabas Hospital. Thirteen weeks gravid, her last menstrual period was April 10, 1946; the expected date of confinement was January 17, 1947. The menarche was at thirteen years and the menstrual periods were regular every thirty days, lasting five days.

The patient's past history revealed erysipelas and pneumonia at nine years of age, tonsillectomy at nine years of age and hay fever and recurrent attacks of asthma up to and including the present. In April, 1945, she was seen at another clinic for hemoptysis and pain in the left chest aggravated by deep inspiration. At that time there were breath-sound changes in the left posterior chest with depression of the anterior chest wall and the heart was on the right side. The patient was given sulfonamides and told she had a diaphragmatic hernia.

Physical examination was negative for the period of gestation except for the chest. The maximal cardiac impulse was to the right of the sternum in the fifth intercostal space. The pulse rate was 90, blood pressure 108/60 and respirations, 28. A few rhonchi were heard throughout the entire right and upper left chest and intestinal peristalsis was heard in the left lower anterior, lateral and posterior areas of the chest. The urine and the blood Kahn test were entirely negative. The blood was Type A Rh positive. The hemoglobin was 16.1 gm. (98 per cent) and there were 4.8 million erythrocytes. The ante-partum course was normal except for occasional edema which was controlled with ammonium chloride and a salt-poor diet.

On January 15, 1947, in her thirty-ninth week the patient spontaneously went into labor. Labor was desultory for fifteen hours after which it became tumultuous; after sixteen hours of total labor the patient was delivered of a 6 pound 12 ounce living male child under open drop ether. (Regional analgesia had been contemplated but lack of time for preparation prevented this.)

During the first twenty-four hours postpartum the patient was kept in the Trendelenburg position and thereafter was gradually raised to a sitting position over the next three days in an effort to avoid sudden emptying of the diaphragmatic sac. Twenty-four hours postpartum the patient had a chill and temperature of 101°F.; 770,000 units of penicillin were given. X-ray examination of the chest on January 21, 1947, showed the lungs to be clear and a congenital eventration of the diaphragm to be present, with the heart displaced toward the right and compression of the lower right lobe on deep inspiration. (Figs. 1 and 2.)

The patient was discharged from the hospital on the seventh postpartum day, January 22, 1947. At the postpartum check-up February 28, 1947, a cervical erosion was found and cauterized. Physical examination was otherwise negative except for the persistant dextrocardia and retrocostal peristalsis.

On May 25, 1948, the patient again presented herself at St. Barnabas Hospital. Her chief complaints were fatigue of four months with occasional cough, morning hemoptysis and prune-juice sputum. The last regular menses was March 12, 1948, but on April 20, 1948, there was a sudden gush of vaginal bleeding with clots. This was followed subsequently by a white leukorrhea. Physical examination of the chest and fluoroscopy were essentially the same as previously noted. The fundus uteri was the size of a two months' gestation and the cervix was soft. The expected date of confinement was

dropped from 110/78 to 80/50 and the pulse slowed from 96 to 72; but within five minutes without any treatment the warm feeling disappeared and the pulse and blood pressure returned to their previous levels. At 8:00 A.M. x-rays were taken in an attempt to demonstrate the effects of labor on eventration as shown in Figure 3. At 9:16 A.M. after a total of four hours and sixteen minutes of labor an 8 pound 5 ounce living male infant was delivered by low forceps under 50 mg. novacain spinal analgesia. The postpartum regimen was the same as for the previous delivery except that the Trendelenburg position for twenty-four hours was eliminated. The postpartum course was uneventful except for a so-called spinal headache. X-rays were taken the day before discharge as shown in Figure 4. The patient was discharged from the hospital on December 24, 1948, on the sixth postpartum day.

At postpartum check-up February 17, 1948, all was noted as previously. The cervix was clean but a 3rd degree retroversion of the uterus was present. An electrocardiogram taken at that time showed the dextrocardia to be acquired in character and the patient's vital capacity was 3,400 cc. The patient was discharged at that time. (At a later visit, June 10, 1949, for moniliasis the retroversion was no longer present.)

## COMMENTS

Eventration of the diaphragm differs from diaphragmatic hernia in that there is no defect in the continuity of the diaphragm. On the contrary, there is a predominence of fibrous tissue instead of muscle in one leaf of the structure and that leaf takes no active part in respiration. The condition is more common on the left side[3] and is never seen bilaterally inasmuch as total absence of any diaphragmatic activity would probably be incompatible with life. The condition is apparently congenital in origin although some authors[3] believe it is due to phrenic neuritis early in life and subsequent atrophy of the diaphragmatic musculature with fibrous replacement. The physical and x-ray findings are similar to those seen after a phrenicotomy. When left sided the heart is displaced toward the right as in the case herein presented; but left sided displacement does not necessarily follow right sided eventration as pointed out by Feldman et al.[1]

There have been five maternal deaths from diaphragmatic hernia reported in the literature,[4] all due to incarceration or its sequelae. Within a month previous to this writing a sixth (as yet unreported) maternal death has come to my attention in a patient who had been operated upon three years before for esophageal stricture. The possibility that the case reported in this article might incarcerate was considered and feared during the first pregnancy while working under a mistaken diagnosis. Such an eventuality is impossible with eventration. The reason for this impossibility is that while intestinal or other abdominal contents are deep in the thoracic cage, none are to be found above the diaphragm. Further cause for concern was mediastinal shift and sudden death, thereby, during labor. It was feared that the sudden evacuation of the thoracic contents and pressure at the time of delivery coincidental with the lowering of abdominal pressure might cause a shock-like state such as seen following abdominal paracentesis for ascites. The fact that the blood pressure dropped precipitously from 110/78 to 80/50 suggested that such a condition might have been present. The slowing of the pulse at the same time is further evidence of a vagal reaction.

Of all the phenomena in this case the occurrence in the seventh month of symptoms suggestive of congestive heart failure is most interesting. It will be noted that at that time dyspnea, tachycardia and decreased vital capacity appeared. These improved on restricted activity. It is difficult to conceive that congestive heart failure should occur due to chronic displacement because other well known causes for such displacement such as tumors and pleural effusion are almost never a cause for failure. It is possible, of course, that the marked hydremia of the seventh month is just too much for a heart in a displaced position. The occurrence of a similar episode of dyspnea, improving toward the end of preg-

nancy is to be noted in the case reported by Murless.[2]

Surgical correction of the eventration was considered but discarded as unnecessary and pointless since the shortened diaphragm would still be functionless. Sterilization likewise was dismissed inasmuch as the patient had gone through two successful pregnancies with no unmanageable complications.

SUMMARY

1. A case of eventration of the diaphragm concurrent with two pregnancies is added to the literature.

2. It is speculated whether this condition is the cause of certain complications during pregnancy.

3. Surgical intervention for repair or sterilization is unwarranted.

*Acknowledgement:* The author wishes to express thanks to Dr. Harvey E. Nussbaum for help with the internal medical aspects of this case, Dr. Peter J. Gionquinto for help with the roentgenology and Dr. Daniel G. Jarvis for help with the obstetrical aspects of this case.

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# DESMOID TUMOR IN THE MALE

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A CASE of desmoid tumor in the male is described because of the extreme rarity of this condition and because of its interesting histology.

The desmoid tumor named by Mueller[1] in 1838 because of its dense, tendon-like consistency is a hard tumor occurring in the anterior abdominal wall. It takes its origin usually from the sheath of the rectus muscle or from adjacent muscles. It is a solitary lesion which frequently infiltrates adjacent structures such as peritoneum, the iliac bone and adjacent joints. However, it never metastasizes.

The cut surface of the desmoid is gray and a grating sound is produced by the knife. The size of the tumor may vary up to 40 pounds.[2]

While the histology in the beginning is that of a fibroma, malignant transformation can occur at any time so that the appearance is that of a sarcoma. In the case described rapidity of growth, which is indicative of malignant changes, occurred twenty-two years after the tumor was first observed.

The desmoid tumor is rather rare. Pack and Ehrlich[3] report seventeen cases, three of which occurred in males out of 50,346 cases of neoplastic disease at Memorial Hospital. This is an incidence of .03 per cent of hospital admissions. Based upon this and similar reports the consensus is that this lesion is most prevalent in females and that pregnancy is the most common contributory factor since the tumor develops shortly after gestation. The case to be described, while occurring in the male, is nevertheless characteristic.

## CASE REPORT

The patient was a sixty-five year old Italian male who presented himself because of a painless mass in his right upper quadrant. He had noticed a lump in this area for some time but more recently it had doubled in size. Because of rapidity of growth he sought medical aid.

Examination disclosed a tumor mass 7 by 5 cm. situated within the rectus muscle in the right upper quadrant. The mass was hard and its long axis was in the line of the rectus muscle. The tumor was somewhat fixed to the adjacent structures. The overlying skin was free, movable and uninvolved.

The possibility of a desmoid tumor was considered. Consequently, under local anesthesia, the tumor mass and a small area of surrounding fascia and muscle were removed. The wound was closed without drainage. The wound healed uneventfully and the patient resumed his usual activities in about one week. The histologic report was as follows: Macroscopic examination revealed an oval-shaped mass of tissue which measured 6 by 4 cm. lobulated and on section there were hemorrhagic areas. Some of these were hard, firm and flesh colored while others were quite granular, soft and gelatinous in appearance. Microscopic examination revealed this was a malignant tumefaction which originated in the sheath of the rectus muscle and was composed of spindle-shaped cells. In some areas it was highly cellular. These spindle-shaped cells were unequal in size and shape and had hyperchromatic nuclei, with a moderate number of mitotic figures. The cellular outlines of these cells were indistinct and the collagen between these cells varied. In some areas the collagen was quite abundant and in others it was absent. In addition, there were areas in which we saw myxomatous degeneration and large areas of hemorrhage. This tumefaction infiltrated into the surrounding adipose tissue. The diagnosis was spindle cell sarcoma of the sheath of the rectus muscle.

The patient when last observed twenty-eight months after operation showed no evidence of recurrence.

This case presents several interesting points for discussion. Both illustrations shown in this article were taken from the

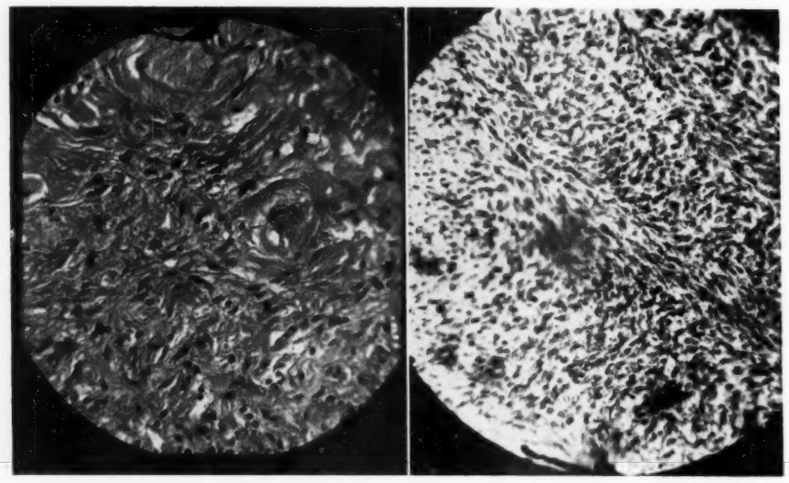

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FIG. 1. This section demonstrates an abundance of collagen with a moderate number of cellular elements which do not demonstrate malignant characteristics. The appearance is that of a fibroma.

FIG. 2. This section demonstrates a highly cellular tumor containing spindle-shaped cells unequal in size with numerous mitotic figures and hyperchromatic staining. Very little collagen is present. The appearance is that of a fibrosarcoma.

same tissue. Figure 1 looks like an ordinary fibroma. Figure 2 was interpreted as a spindle cell sarcoma. This graphically emphasizes the importance of multiple histologic sections.

The long history of this case suggests that the tumor originated as fibroma which in undergoing neoplastic changes assumed rapid growth characteristics.

If one were to study the illustration of the spindle cell sarcoma and not be aware that it was taken from the rectus muscle, he would give the patient a very poor prognosis. Nevertheless, while the tumor appears highly malignant under the microscope, patients are cured with a complete local removal since the desmoid never metastasizes. Clinically, one should suspect a desmoid rather than a fibroma when the lesion in the rectus muscle is not encapsulated and when it has infiltrative characteristics.

In summary, an usual case of desmoid tumor in the male is presented with a follow-up of four years, without recurrence. Emphasis is placed upon the fact that the desmoid tumor may appear highly malignant histologically; nevertheless, clinically, it is not a serious lesion since local removal usually results in a cure.

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# New Instruments

## THE SURGICAL TEACHER

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THE surgical teacher consists of a slide projector adapted to the showing of 2 by 2 inch slides, and a prearranged collection of slides which may be shown in sequence during a surgical operation. A special spark-proof floor switch connected to the projector makes possible the continuous exhibition of the slides, controlled by the surgeon, from the operating table. The slides may be shown on a small, conveniently arranged screen as desired in sequence corresponding with the stage of the surgical procedure. (Fig. 1.)

Scientific studies have revealed that visual education is sixteen times more rapid than the lecture method. It is with this in mind and to give methodical and systematic approach to the operative procedure that this method is advocated. It will be of value to the patient because the operation will be carried out with system and without the confusion often encountered in the teaching operating room. It will be of value to the surgeon because his surgical assistants will receive necessary instruction systematically and quietly, which will teach as the operation progresses and makes them anticipate the next step in the operation. It will be helpful to the instrument nurse for technic and training and will be of value to the anesthetist because, by following the teacher, the anesthetist will appreciate the stage of anesthesia which is necessary. It will be of value, also, to the operating room supervisor for, by a glance at the screen, she will see the progress of the operation.

An example of how a series of slides may be prepared and placed in the projector to be shown by the surgical operator in sequence as desired during an abdominal hysterectomy and appendectomy might begin as follows: (1) abdominal incisions; (2) composite drawing of abdominal wall showing muscles and blood vessels; (3) sagittal section of abdomen showing relation of normal and distended bladder; (4) insertion of self-retaining retractor; (5) packing off the pelvis; (6) examination of abdomen, drawing showing sequence; (7) anatomy and circulation of uterus; (8) clamping sides of uterus; (9) exposure of right infundibulopelvic ligament and (10) anatomy, right ovarian vessels.

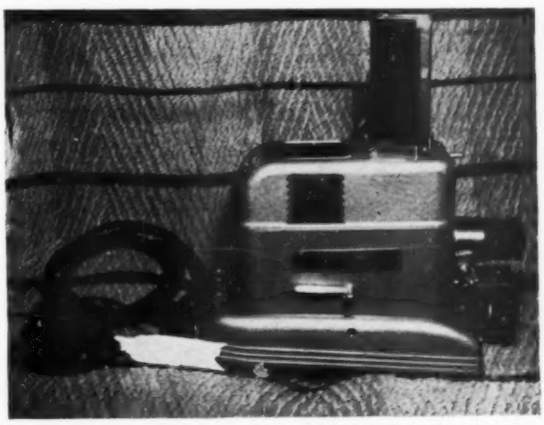

FIG. 1. Automatic projector and foot switch for showing slides during the operation.

A film device is also being developed to bring the particular frame or picture back if it is desired to show a step in the operation again.

# A NEW DISSECTING HEMOSTAT*

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THERE are many surgical situations in which a vessel or duct must be dissected bluntly yet delicately from the surrounding tissue before a clamp is placed. The instrument to be described has been developed to simplify and add safety to such dissections. It has been used to advantage particularly in thyroidectomy and cholecystectomy. It is offered as a valuable adjunct in everyday surgical technic and not as another gadget for occasional use.

The essential feature of the instrument is that it has a slightly curved prolongation attached to one of the blades of a curved hemostat. This simple modification of the average curved hemostat permits the saving of at least one extra instrument and considerable time in dissection. Most surgeons will agree that whenever feasible they prefer to ligate behind a clamp rather than do a loop ligation and cut between the ties. The aneurysm needle is a valuable instrument because it allows for the passing of suture material about a duct or vessel. However, cutting between free ties is fraught with obvious dangers. The instrument described herein has the advantage of serving as an aneurysm needle and a clamp at the same time, thus giving the surgeon the added security of ligating behind a clamp and yet getting around the structure with the same instrument. (Fig. 1.)

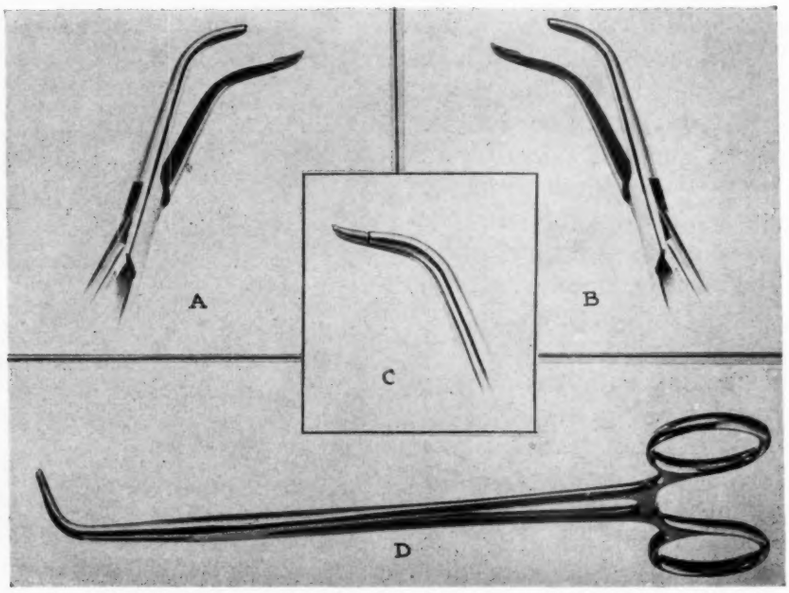


FIG. 1. A, left-handed model of dissecting hemostat with blades open showing shape of dissecting nose; B, right-handed model with similar view; C, appearance of instrument with blades closed; D, full-length view of instrument; modified from Mixter-type forceps.

For example, in dissecting the superior thyroid vessels for ligation it is often necessary to dissect them bluntly by spreading a hemostat. The hemostat is then held in a

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spread position while two other instruments are passed between the open blades to clamp the vessels. Thus one instrument is used for dissection and maintaining a free passageway behind the vessels while the other instruments are used to clamp the vessels. With the new dissecting hemostat it is possible to dissect behind the vessel with the blunt nose dissector of the instrument while in the same motion the structure becomes clamped. In this way the technic is facilitated and is much less clumsy. A right and left clamp make it possible to attack the structure from either side. The same situation holds in the dissection and clamping of the cystic duct and cystic artery in cholecystectomy. With one motion the nose of the instrument dissects behind the structure to be clamped and the clamp is immediately closed with no more ado about the removal of one instrument and the insertion of another. (Fig. 2.)

A further source of security to the surgeon in the use of this instrument is that the long nose on the blade makes it considerably easier to ligate the structure involved since the suture material cannot slip off the tip of the clamp because of the additional metal beyond the clamped structure. This makes it possible to hook the suture material behind it easily even in deep places. Dissection can be carried out with the blades either open or closed; and if the structure is large, dissection can be begun with the blades closed. When the nose of the instrument slips under the structure, the blades can be open so that the clamping is done without withdrawing and reinserting the instrument.

This design can be applied in principle

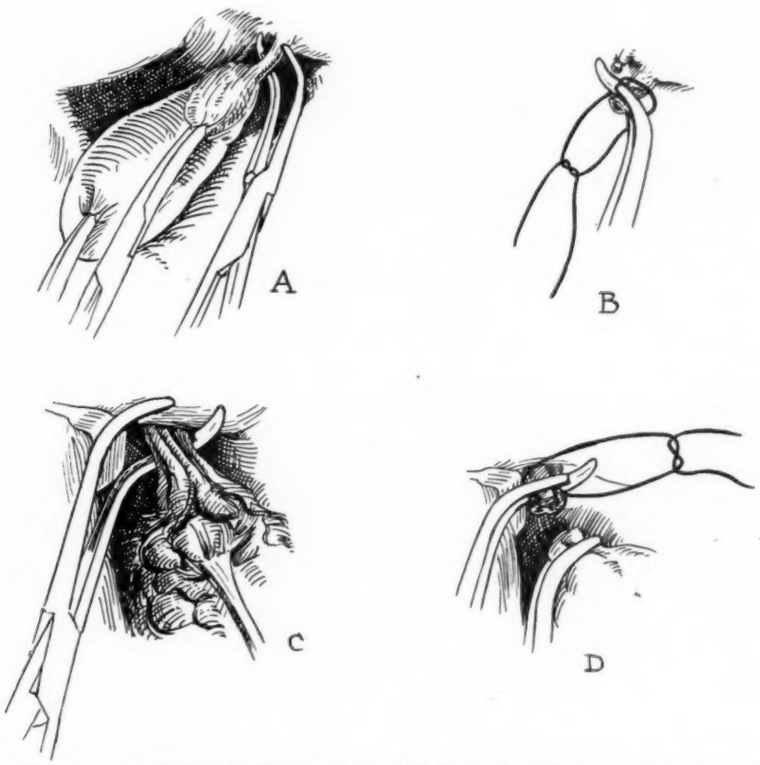


FIG. 2. A, cystic duct is dissected free and clamped with one motion; B, by hooking ligature behind dissecting nose of clamp ligation in deep places is facilitated and the ligature cannot slip off the tip of the instrument; C, dissection and clamping of superior thyroid vessels; D, shows ease of ligation behind clamp.

to modify any curved forceps in use today. Thus the surgeon can adapt this principle to apply to larger as well as smaller hemostats.

SUMMARY

A new dissecting hemostat is presented which greatly facilitates the dissection and clamping of certain ducts and vessels. It is particularly applicable in thyroidectomy and cholecystectomy. It has also been used in saphenous vein ligations and similar procedures. The advantages are enumerated above. The simplicity of the instrument makes for a wide field of applicability in practical, everyday surgery.

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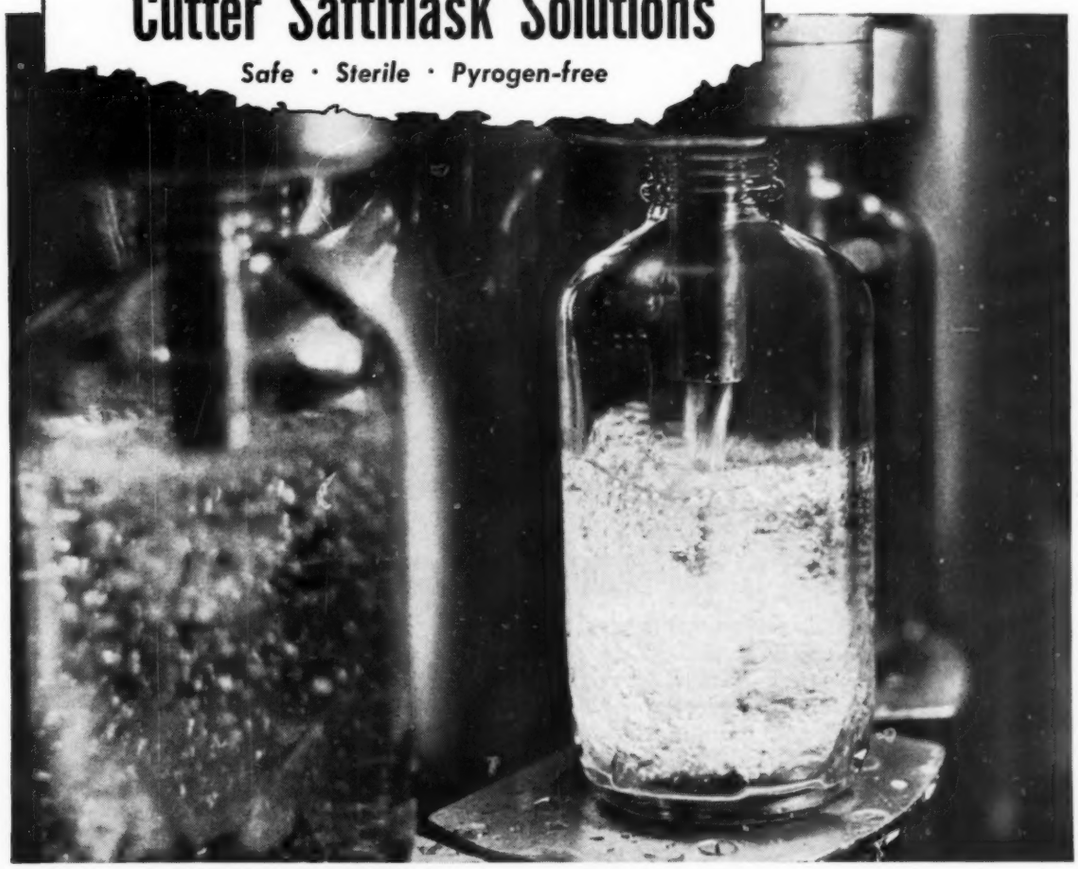

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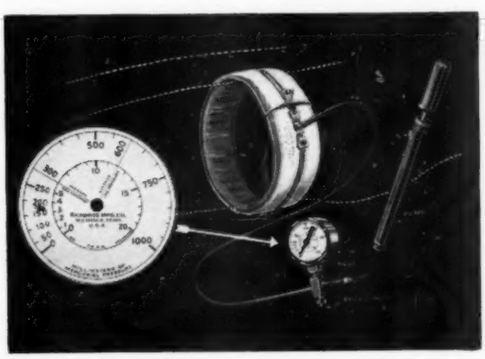

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Special use for the tourniquet suggested by Breck and Basom. See *The Journal of Bone and Joint Surgery*, XXIV, 461, April 1942

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THE COMPLETE ORTHOPEDIC SUPPLY DEPOT

# Outside the Ivory Tower

(*continued from page 22*)

WE copy this in part from the New York Herald-Tribune, in "You and Your Government" by James E. Warner.

More than forty different Federal agencies are spending about $2,000,000,000 a year giving various types of medical service to 24,000,000 persons, one-sixth of the population. Duplication of such medical facilities operated by the Federal government results in extravagance both with the taxpayers' money and with medical manpower, already short in a serious peacetime situation which would become critical in the event of war. Never again, says General Paul R. Hawley, former chief surgeon in the European theater, now executive officer of the Blue Cross, can we drain such a large proportion of medical men away from the civil population as was done in World War II.

The Hoover Commission's answer to the problem—with some dissent among its members—is creation of a United Medical Service which would include virtually all Federal hospitals on the theory that a sick man is a patient, whether he's a seaman, a veteran or an Indian. That something needs to be done is shown by statistics on the average length of hospital stay in government and private hospitals during the first eight months of 1948.

If you had your tonsils out in a private hospital, your average length of stay was only 1.4 days, these figures show. But if you had them out in a United States Public Health Service hospital, you stayed 6.8 days; in a Veterans Administration hospital 8.0 days; in an Army hospital, from 3 to 16.1 days and in a Navy hospital, from 2.5 to 13.3 days.

DURING the past few months many books have been sent to us for review. Some of these we could judge. Others we farmed out to experts in various fields for their opinion. Except in rare instances we have found that even the formal, long, involved book review is uninformative. When we scan a list of new books, we look for those in which we are particularly interested. It is common sense that an ophthalmologist does not waste much time on a book dealing with flat feet, nor does a gynecologist do more than skim a review of a work on neurosurgery. Therefore, we have decided to list the new books that have been accorded an AAA listing, books we can honestly recommend to a reader:

Operative Obstetrics, A Guide to the Difficulties and Complications of Obstetric Practice. By J. M. Munro Kerr, M.D. and J. Chassar Moir, M.D., 5th ed., 948 pages, illustrated. Baltimore. The Williams & Wilkins Co.

Intestinal Intubation. By Meyer O. Cantor, M.D., 333 pages, illustrated. Springfield, Ill. Charles C Thomas.

Advances in Surgery. By an Editorial Board of ten outstanding scientists, Vol. II. New York. Interscience Publishers, Inc.

Essentials of Obstetrical and Gynecological Pathology. By Robert L. Faulkner, M.D. and Marion Douglas, M.D., 2nd ed., 300 illustrations, including 3 color plates. St. Louis. The C. V. Mosby Co.

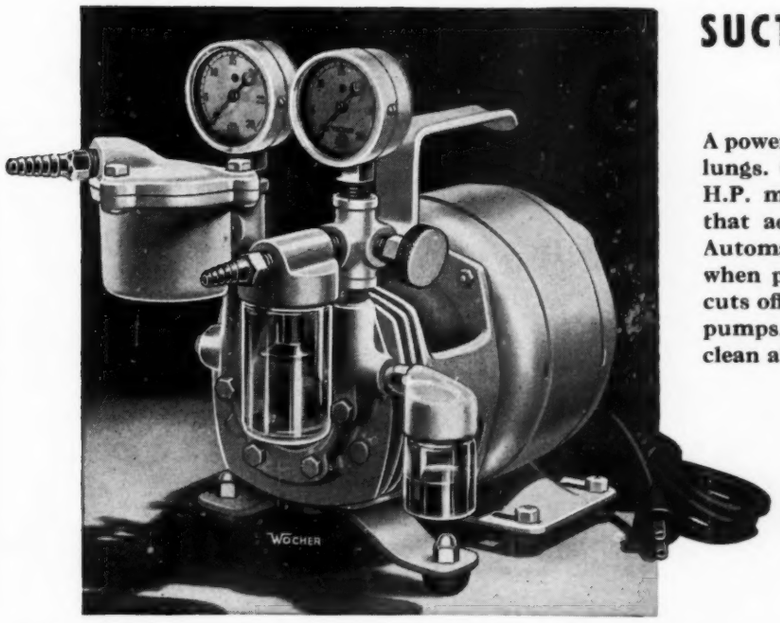
Acute Injuries of the Head, Their Diagnosis, Treatment, Complications and Sequels. By G. F. Rowbtham, B.SC. With a Foreword by Professor Norman M. Dott. 3rd ed., with 259 illustrations, 34 in full color. Baltimore. The Williams & Wilkins Co.

Breast Deformities and Their Repair. By Jaques W. Maliniac, M.D., 193 pages, illustrated. New York. Grune & Stratton.

Surgery for Nurses—A Text-book for the Surgical Nurse. By James Kemble, ch.M. With frontispiece and 374 illustrations of which many are in color. Baltimore. The Williams and Wilkins Co.

Handbook of Surgical Urology for Interns, Hospital Corpsmen and Nurses. By Nelse F. Ockerblad, M.D., 189 pages, illustrated. Baltimore. The Williams and Wilkins Co.

# "Whirlwind"

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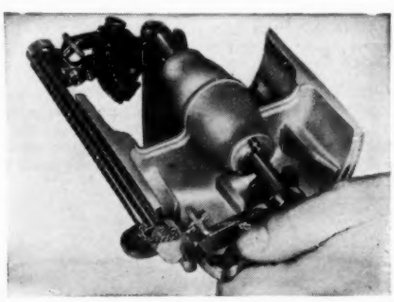

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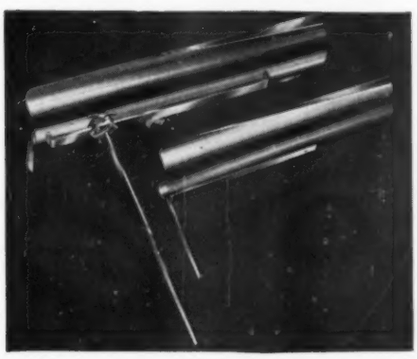

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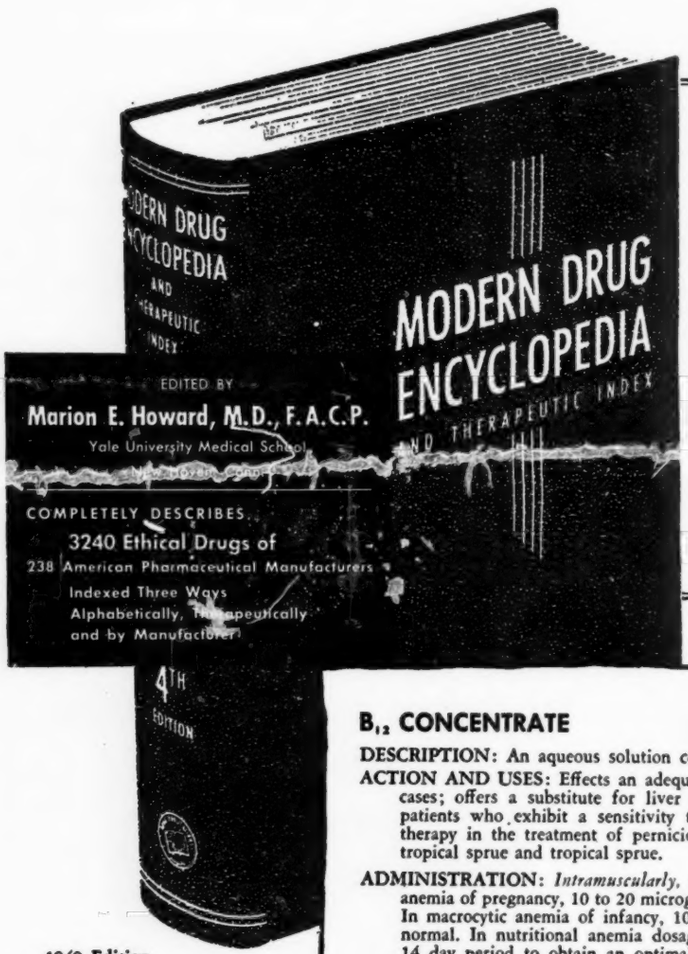


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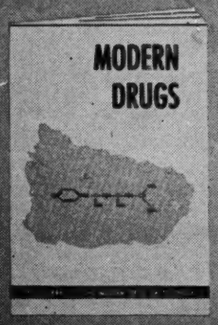


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In all subjects—men and women alike—no significant weight changes were observed at any time, either during the "no breakfast" periods or when breakfast provided as much as 1,000 calories. Evidently, caloric intake during the other two meals was automatically adjusted to satisfy energy needs. In addition, omission of breakfast decreased mental acuity and maximum work output during the pre-noon hour, thus indicating a decidedly undesirable physiologic insult to the organism.

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The presence of this seal indicates that all nutritional statements have been found acceptable by the Council on Foods and Nutrition of the American Medical Association.

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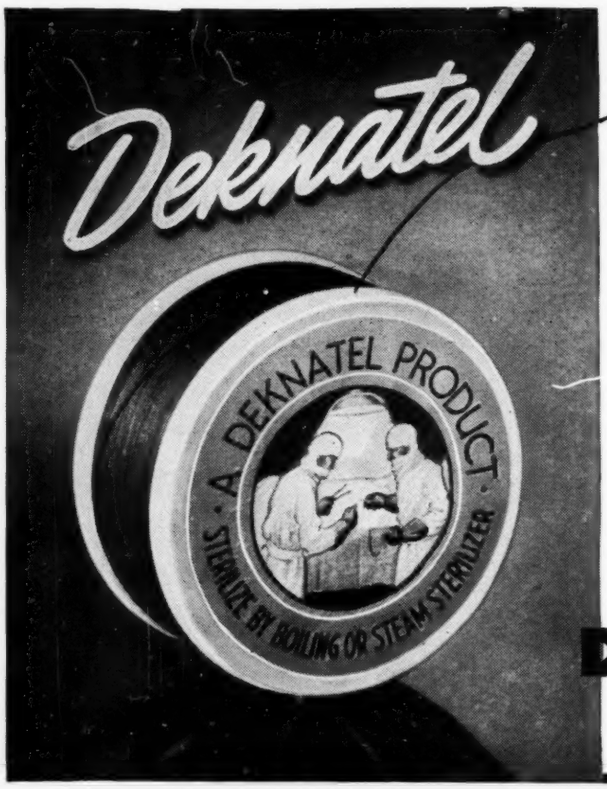


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*These physiologic advantages are related mainly to the protein content rather than to the caloric content of the breakfast.* In fact, when isocaloric breakfasts were compared, those with the higher amounts of protein led to the greatest beneficial effects. Breakfasts providing the lower quantities of protein (7 Gm., 9 Gm., 16 Gm., and 17 Gm. respectively) produced a rapid rise in the blood sugar level and a return to normal during the next three hours. Breakfasts providing more protein (22 Gm. and 25 Gm. respectively) produced a maximal blood sugar rise which was lower than that following the breakfasts of lower protein content, but the return to normal was delayed beyond the three hour period.

The subjects on the higher protein breakfasts "reported a prolonged sense of well-being and satisfaction." The findings indicated that the beneficial effects of the high protein breakfast on the blood sugar level may extend into the afternoon.

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*Orent-Keiles, E., and Hallman, L. F.: The Breakfast Meal in Relation to Blood-Sugar Values, Circular No. 827, United States Department of Agriculture, Bureau of Human Nutrition and Home Economics, Agricultural Research Administration, Dec., 1949.

The Seal of Acceptance denotes that the nutritional statements made in this advertisement are acceptable to the Council on Foods and Nutrition of the American Medical Association.

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# The American Journal of Surgery

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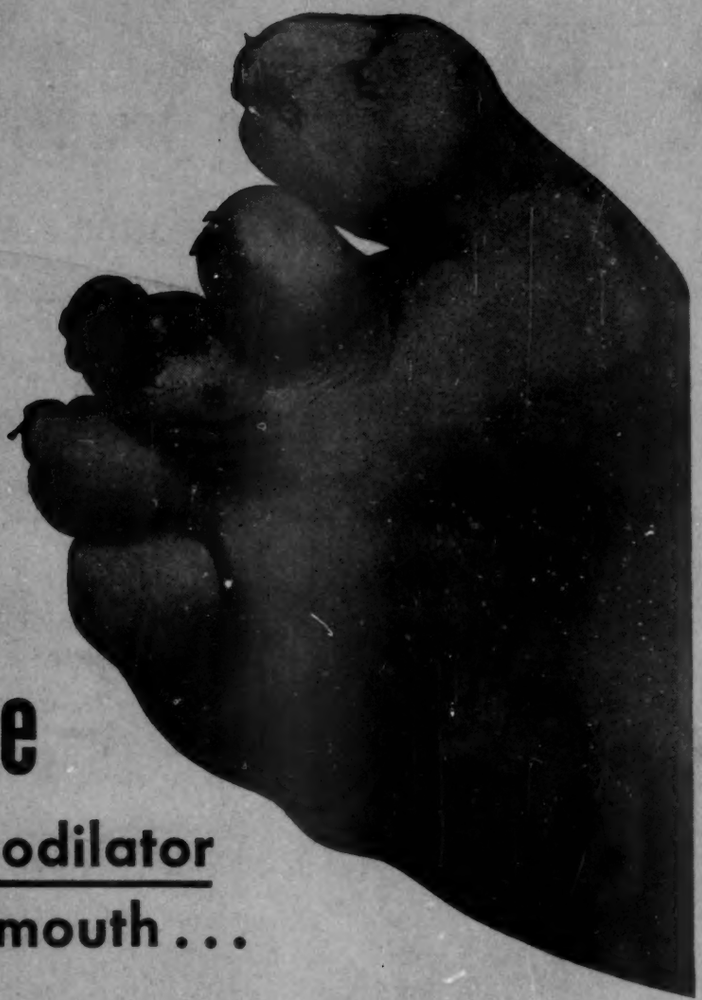

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*Comprehensive literature on request.*


1. Rogers, Max P.: J.A.M.A., May 21, 1949
2. Wyatt, Bernard L.: Ann. West. Med. & Surg., Aug. 1949
3. Grimson, Marzoni, Reardon & Hendrix: Ann. Surg., 127:5, May 1948


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